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The INDUSTRIAL-ARTS MAGAZINE

MARCH
1925

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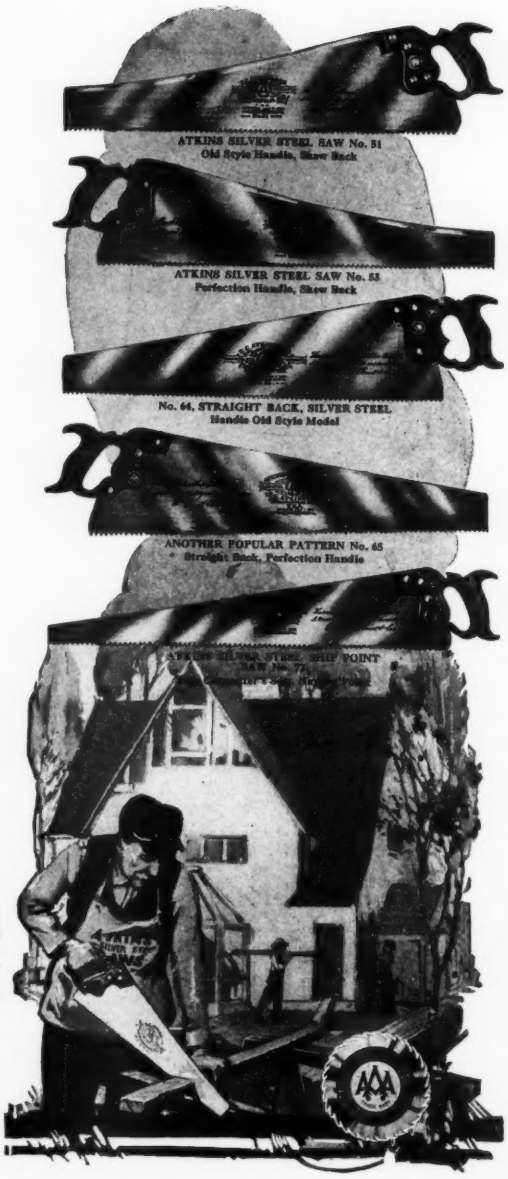
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March,
1925

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Our Supplement

A PART of this issue of the INDUSTRIAL-ARTS MAGAZINE is a series of four blue prints for the cabinet-making class. These are complete with bills of materials and can be used directly in the school shop.

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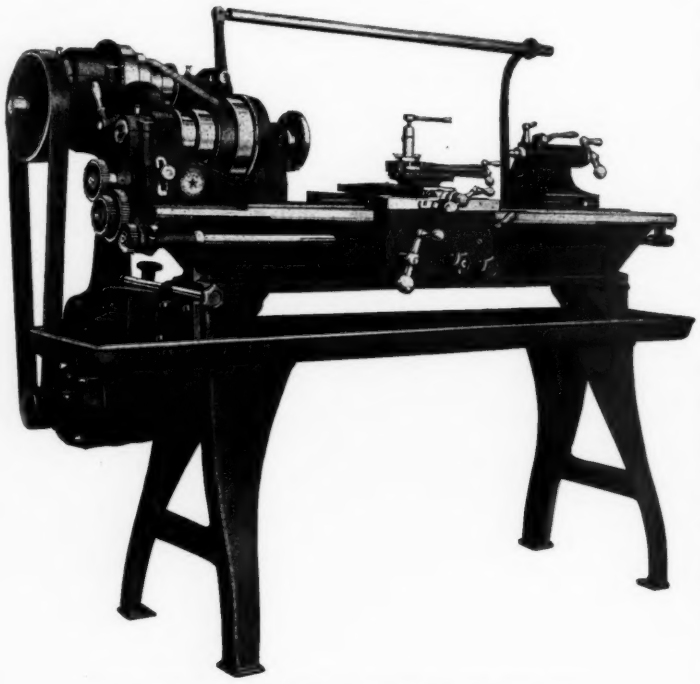

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THE INDUSTRIAL ARTS MAGAZINE

Volume XIV MARCH, 1925 No. 3

Factual Bases for Curriculum Building in Junior High School Industrial Arts[1]

A. H. Edgerton, University of Wisconsin

A BRIEF analysis of present-day practices in American secondary schools shows clearly that there is a growing consciousness of the need for having youths of 12 to 15 years of age, and older, encouraged to acquire vocational knowledge and insight as a basis for judgment and choice. For many children, a public school education now includes a reasonable amount of exploratory experience for the purpose of giving desired information and perspective relative to occupational possibilities and employment conditions.

Both the rapid growth of intermediate and junior high schools, and the subsequent development of specialized curricula in a number of senior high schools, as well as in separate vocational or trade schools, represent a serious attempt to assist all children, regardless of their social status or possible life work, in meeting current and changing demands for individual expression and social service. This growing tendency to respect individual differences by providing varying degrees of differentiation during the secondary school period, implies that pupils should be provided with the kinds and qualities of experience in knowledge and skill which will assist them in establishing those habits, attitudes, and appreciations that contribute most to the daily lives of citizens, consumers, and producers.

Our Opportunity and Obligation During the Junior High School Period

The broader conception of the junior high school is based on a philosophy of better occupational adjustment and happier social welfare. Our social and economic needs of today would seem to call for instruction and guidance which aim (1) to challenge and develop the pupil's present interests, aptitudes, and capacities and (2) to train and educate him for the many-sided demands which the future is expected to make upon him. These needs assume that each school system is obligated to assist all of its pupils by means of suitable curricula for aiding those who continue their school work to plan their programs more wisely in secondary and higher education, and also for helping those who might find it advisable or necessary to leave school with a minimal amount of preparation to choose their respective procedure more advantageously.

The school must continue to impart certain so-called fundamental skills and knowledge to each pupil; however, its obligation does not end here. It must anticipate the time when the pupil shall have completed his schooling, and taken his place in the workaday world. It must strive to see that the educational offerings are such that the pupil may be helped to contribute his best to society by means of desirable attitudes, habits, appreciations, and powers, and, by so doing, secure for himself the greatest happiness. This desired result is too significant to be left to chance. It can come about only by causing the pupil to consider his own assets or capacities and the various opportunities for developing them. The school, therefore, must unconsciously and definitely make provision in its curriculum for accomplishing this result.

During the past few years marked reorganization has been noted in secondary schools throughout the United States. As a result of this tendency, decided changes are found in the purpose, content and method of the activities now provided both in industrial courses as a means of general education and in classes for preliminary industrial training.[2] The adolescent, or so-called "self-finding," period seems to demand appreciative insight into a sufficient number and variety of representative experiences to help pupils explore, discover, and develop varying amounts of capacity for achievement. Such tests for negative and positive accomplishments would preferably include understanding and doing of industrial work, as well as some elements of management and supervision of similar situations.

Unfortunately, the terminology for these different courses lacks general acceptance and universal adoption; consequently, certain obvious confusion has resulted because of the different designations used in various school systems. However, those persons who are charged with the responsibility for developing the separate courses for general educational purposes and for certain limited values in wage-earning preparation, are well aware that these new developments in the seventh,

[1] This paper constituted the basis of an address before the Shop Teachers' Section of the Wisconsin Teachers' Association, November, 1924.

[2] It should be noted that school preparation for industrial occupations should always be supplemented by definite instruction on the job, if the best results are to be obtained.

eighth, and ninth grades are gradually forcing the discontinuance of similar objectives and activities on the high-school level, where accepted junior high schools exist. In answer to the challenge, several senior high schools, *aside from separate trade and technical schools,* have arranged specific plans of part-time cooperation through vocational departments for those who expect to enter industrial callings rather than colleges.

On the other hand, increasing numbers of teachers and administrators in large and small school systems are insisting that adolescent pupils need to "explore" to gain knowledge of a reasonably wide range of industrial and allied activities. The diversified courses often provide first-hand information and experience in important aspects of manufacture, transportation, and commerce as a general foundation and, to some extent, for guidance in their life work.

The seventh and eighth grade pupils in many cities are being provided with exploratory experiences in a number of interesting and profitable industrial activities, while they are continuing their studies in several subjects with other differential groups of students. This plan, including reliable occupational information and systematic counsel, frequently gives pupils, counsellor, and teachers some sane basis for the future adjustment of courses and the selection of life work. When the study of vocations is based upon factual material, rather than upon opinion, which naturally is variable, pupils are better enabled to enter their life careers with some vision of the vocational opportunities and employment requirements that constitute an intelligent choice. Experience in several schools has demonstrated beyond doubt that this procedure has been an incentive for causing a growing number of pupils to continue through the ninth grade and to enter the senior high school. In such cases, it is reported that they usually choose courses more wisely and make better progress from the outset.

Improved Methods Needed in Curriculum Building

Honest differences of opinion as to claim and interpretation have frequently existed among those who are concerned with the important distinctions, meanings, relationships, and functions of the courses of study for industrial arts education. Because of the various bases employed in determining the purpose, content, and method of the industrial activities for the seventh, eighth and ninth years, many discrepancies have been pointed out as a result of recent school surveys and investigations.

The following outline of facts, which is based on a recent study relating to 7,389 pupils in 379 intermediate and junior high schools in different sections of the country, shows clearly that large numbers of these selected courses include many features which are extremely wasteful and omit much that is useful, mainly because they have been organized without consideration for *how* and *what* seventh, eighth, and ninth grade pupils can learn most advantageously:

I. Seventy-eight per Cent of These Schools Emphasize Operations or Processes without Respect for the Specific Needs and Interests of Their Pupils

A. Many of these courses require all pupils to make formal models or exercises, which give considerable technique in the use of tools but offer little else of real value.

1. These courses vary from iron-clad series, which allow no place for individuality, to instances where the instructors set the task and choose the models at first, but later allow the pupils a very limited choice.

a. Some require the pupils to construct a number of abstract joints of wood (a few of which are no longer in common use) without even making the connection for the pupils between the doing of the work and the actual use which would be made of such joints.

b. Others still require a definite number of exercises, such as key racks, tooth-brush racks, tie racks, coat hangers, book racks, sleeve boards, etc., which are made by all pupils regardless of whether or not there is any particular interest in or need for these experiences.

B. Nearly sixty per cent of those courses allow the pupils to take part in production work or to make worth while constructions, thus allowing the manipulative skill to be incidental to the making of the project, but completely fail to allow them an opportunity to think out and make definite plans to meet the difficulties involved in their problems.

1. Many of the pupils are required to do their work in a certain prescribed way, since the instructors often over-emphasize the following of directions and make very little allowance for initiative.

2. A large number of the instructors are encouraged to do much of their pupils' work, since the success of their courses is frequently judged in terms of the quantity and quality of work displayed at the annual school exhibition.

C. The work (construction and study) in over twenty per cent of these courses is confined to woodwork only, which offers somewhat limited possibilities for obtaining concrete experiences and studying present-day industry.

1. These courses frequently neglect to represent various types of industrial work ranging from projects, which may be done well by pupils having little general ability, to those which require the highest kind of general and specialized ability.

a. The courses which emphasize only manual skill in the use of a few woodworking tools (perhaps, rightly called manual training) can do little more than to reveal capacity for manipulative skill.

b. The best of these courses in woodwork, even though they properly represent the divisions in the woodworking industry, can only reveal whether or not pupils respond to them with their interests and aptitudes.

II—Emphasis in 22 Carefully Selected Industrial Arts Courses

On the other hand, the 22 most successfully conducted industrial arts courses, located either in junior high schools, or in intermediate schools, aim to accomplish the following general objectives:

1. To give a broad appreciation of economic production in order to demand more respect for the various workers and their work;

2. To prepare for construction and maintenance needs as well as for more intelligent judgment and use of industrial products and service;

3. To help develop insight into industrial methods, conditions, and relationships to promote more efficient production by means of better selection of and adjustment in occupations;

4. To offer opportunity for testing the interests and aptitudes of the pupil in order that worthy talent may be developed through specific training.

I. In these courses, which represent about six per cent of the total number investigated, the manual aspects of the work, and the studies of conditions and processes in present-day industry include various types of concrete experiences selected from such occupational pursuits as printing and publishing, electrical work, mechanical drawing and designing, carpentry, cabinet and furniture

making, pattern making and foundry, sheet metal, forging, machine shop, auto-mechanics, concrete construction, home mechanics, general construction and repair, and the like.

A. The problems, projects, or jobs taken up in connection with the best of these activities result in useful and serviceable products.

1. In several schools, each pupil does a considerable amount of work which emphasizes the time element and accuracy of the commercial shop.

2. Industrial methods used in present-day production are often studied where these can not be duplicated because of the necessarily limited shop facilities.

B. Each organized activity frequently includes studies of conditions in the industries, in addition to giving contact with typical materials, tools, machines, processes of construction, and well-organized shopwork.

1. This information is ordinarily gained through excursions, reliable reading matter, student reports, class discussions, and talks by specialists.

C. The most successful units of work give proper consideration to the kinds and qualities of materials, the appropriate design and construction, the processes of manufacture, the shop applications of physical science, mathematics, and mechanics, and also the industrial history and civics as these relate to the problems under consideration.

D. In the most progressive schools, all pupils are allowed some freedom in choosing their work in order that they may have opportunity to discover the value of any mechanical sense and ability, both in negative and positive ways.

1. There are often definite types of problems to be done in each activity. However, this does not necessarily mean that a pupil must furnish all of the minimal requirements in one kind of work before taking up work in another activity.

a. Pupils entering printing for the first time, for example, are sometimes allowed the choice of several introductory problems in composition, or they may substitute problems of equal difficulty, as is frequently done in connection with outside work when they have facility for doing satisfactory work.

b. An opportunity is also given through the student-foreman organization to try out any qualities of leadership in managing and supervising work and workers in each activity represented.

Studies to Ascertain Factual Bases for Curriculum Building

The urgent need for factual bases for determining the objectives, content, and methods of the industrial subjects has been pointed out repeatedly in connection with the wasteful practices which are now based upon more or less variable opinions in both large and small school systems. During the past year several cooperative studies have been conducted with the purpose of determining more scientific procedure for curriculum building in junior high school industrial arts. The following chart will indicate the nature and the scope of these studies being conducted to ascertain those facts and tendencies which, it is believed, will aid in a more accurate formulation of suitable courses of study to meet the needs and interest of the pupils in question.

As it will be impossible for us to consider the ramifications and implications of more than one of these studies at this time, I shall present the one which, although not the most important in my opinion, might well be a starting point for all industrial teachers who seriously believe that the school experiences should reflect the needs and interests of their pupils.

General Purpose of Investigation

Although it is not claimed that these successful representatives of professional, commercial, and industrial establishments are qualified to make suitable courses of study for secondary school children, it is believed that the judgments of those who will employ and become interested in the product of our public schools, are of sufficient value to warrant careful consideration and comparison with other data. In other words, this is one of the important bases for checking our analyses in order that courses may reflect, to a reasonable degree, both the needs and interests of the learners concerned.

This study was undertaken after preliminary analysis had been made to ascertain what related knowledge is considered either necessary or desirable as supplementary training in industrial intelligence for those secondary school pupils:

I. Who seek understanding of and insight into local industries as a basis for future promotion in industrial and allied callings.

II. Who desire industrial perspective as a part of their training for leadership in business and industrial pursuits.

III. Who wish an overview of the industries to better equip themselves for professional or semi-professional careers.

The reasons for desiring the opinions were explained to each person interviewed in order that full cooperation might be encouraged. As a result, these representatives of various occupational pursuits have generously aided us in securing the following desired information:

Representatives Interviewed

1.	Professional Establishments	62
2.	Commercial Establishments	79
3.	Industrial Establishments	61
	Total	202

1. Professional Representatives Interviewed:

Occupations Represented	Number of Persons
City Officials	7
Clergymen	4
Dentists	8
Engineers	16
Lawyers	12
Musicians	2
Physicians	13
Total	62

2. Commercial Representatives Interviewed:

Agents	12
Bankers	3
Commercial Travelers	2
Foremen and Overseers	11
Managers and Superintendents	12
Real Estate	6
Retail Dealers	12
Retail Salesmen	21
Total	79

3. Industrial Representatives Interviewed:

Builders and Contractors	8
Designers	9
Foremen and Overseers	18
Managers and Superintendents	11
Manufacturers and Officials	15
Total	61
Total Number of Interviews	202

Findings and Implications Resulting from This Study

When one considers the wide range of occupations represented in this study, it is a significant fact that these professional, commercial and industrial interests

FACTUAL BASES FOR CURRICULUM BUILDING IN JUNIOR HIGH SCHOOL INDUSTRIAL ARTS

Investigation of teachers' judgments as reflected in courses of study for 379 intermediate and junior high schools in 21 states.
Listings of frequency in claims as to purpose, content, and method.

Analysis of industrial and allied occupations to ascertain possible and suitable teaching units for seventh, eighth and ninth grade levels of learning.
Selections based on specialist's knowledge of processes, materials, etc., with due consideration to habits, attitudes, and appreciations.

Survey of individual judgments of 202 successful representatives of industrial, commercial, and professional establishments as to desirability or necessity of having pupils acquire different kinds of skill and knowledge listed.
Personal interviews made to obtain these specific reactions.

Inventory of 4,526 seventh, eighth, and ninth grade pupils' interests as evidenced outside of prescribed school work as to (1) participations, (2) observations, and (3) readings of their choice.
These data are being secured in cooperation with several large and small schools.

Report of the Results of Survey

In your opinion, would it be worth while for such pupils who evidence some interest in your profession (or related vocations) to acquire appropriate knowledge concerning the following?

QUESTIONS	Professional			Commercial			Industrial			Totals		
	Not needed	Desirable	Necessary	Not needed	Desirable	Necessary	Not needed	Desirable	Necessary	Not needed	Desirable	Necessary
	Per Cents			Per Cents			Per Cents			Per Cents		
1. How iron, lead, wood, rubber, textiles, oil, paper, and other materials are.												
(a) Affected by different processes in their manufacture	5	78	17	4	54	42	0	56	44	13	62	35
(b) Controlled by their main properties and characteristics	1	40	59	0	35	65	0	38	62	0	38	62
2. How the common and special hand and machine tools in your establishment are:												
(a) Operated (Principles involved)	0	12	88	0	19	81	0	5	95	0	12	88
(b) Designed (Factors considered)	90	7	3	75	20	5	64	25	11	76	17	7
(c) Constructed (Operations executed)	12	61	27	4	55	41	0	59	41	5	60	35
3. How fundamental principles in mechanics affecting levers, gears, belted pulleys, etc., are directly applicable to:												
(a) Kinds of tools and machines used in your establishment	8	80	12	4	68	28	0	65	35	4	71	25
(b) Kinds and qualities of materials used for various purposes	1	60	39	0	54	46	0	30	70	0	49	51
4. How electrical work plays an important part in our daily work through												
(a) Manufacture of electrical appliances	0	58	42	0	70	30	0	48	52	0	60	40
(b) Transmission of power (motors, generators, etc.)	12	61	27	10	76	14	3	72	25	8	70	22
(c) Communication (telephone, telegraph, wireless)	0	62	38	1	67	32	2	51	47	1	60	39
(d) Building and allied construction	8	87	5	46	53	1	0	84	16	20	73	7
(e) Automobile manufacture and repair	10	52	38	3	39	38	2	43	55	5	51	44
(f) Installation and operation of electrical plants	88	8	4	76	20	4	64	29	7	76	19	5
4. How modern printing and publishing offices are managed with respect to:												
(a) Newspaper work	20	72	8	10	65	25	21	66	13	16	68	16
(b) Book and magazine making	20	69	11	9	66	25	13	62	25	13	66	21
(c) Miscellaneous job work	5	72	23	1	74	25	2	75	23	8	74	24
5. How to do simple construction and repair work in order:												
(a) To meet a possible emergency	0	56	44	0	75	25	0	50	50	0	61	39
(b) To effectively instruct workers (new and old)	30	58	12	9	53	38	5	16	79	14	43	43
(c) To properly supervise work (production, organization, maintenance)	27	58	15	5	52	43	0	92	8	10	66	24
(d) To judge the worth of the job (approximate cost and suitable results)	0	56	44	0	67	33	0	44	56	0	57	43
6. What it means to participate in typical units of productive work which stress:												
(a) General spirit of modern shop or office	6	94	0	0	80	20	0	69	31	2	81	17
(b) Time element demanded by methods of particular establishment	6	94	0	0	74	26	0	90	10	2	85	13
(c) Accuracy required by work specifications and facilities	6	94	0	0	70	30	0	92	8	2	84	14
7. What the conditions, requirements and possibilities actually are in these callings or vocations with special references to:												
(a) Nature of occupations	0	97	3	0	99	1	0	99	1	0	98	2
(b) Remuneration	3	97	0	1	99	0	0	100	0	1	99	0
(c) Natural qualifications	0	92	8	0	80	20	0	84	16	0	81	19
(d) Preparation	0	92	8	0	80	20	0	84	16	0	81	19

are mutually agreed as to the *desirability* or *necessity* of having our secondary school pupils acquire the different kinds of knowledge considered. As is shown in detail, the majority of the judgments of those surveyed was found to favor the following:

1. That *technical knowledge* pertaining to the understandings of tools, machines, materials, operations, and principles involved, should be provided with special reference to the needed applications of each class, group, and individual concerned.

2. That *vocational knowledge* pertaining to the conditions, processes, and relationships in present-day commerce and manufacture, should be provided through concrete experiences and related study.

3. That *occupational knowledge* pertaining to the nature of work, qualifications and training, advantages and disadvantages, labor conditions, health problems, future opportunities, and the like, might well be provided in connection with the other studies as a basis for the intelligent choice of courses of study and life work.

Furthermore, it is implied that the course of study which is designed to meet these obvious needs can not be met by providing a mere textbook acquaintance of these closely related studies. In fact, a composite workshop and laboratory is suggested in order that a wide variety of materials, tools, and machines might be available for constant use and study. The general agreement on certain questions suggests that pupils should do a considerable amount of productive work of one kind or another that emphasizes the time element and accuracy of the commercial shop. Then, too, it is suggested that frequent visits should be made to large and small production plants to study methods of production, organization, and maintenance, where the limited school facilities can not provide the necessary facts. In any case, the various units of such a course would be expected to give proper consideration to the kinds and qualities of materials, the appropriate design and construction, the processes and operations of manufacture, the shop applications of science, mathematics and mechanics, as these relate to the problems at hand.

In conclusion, it should be pointed out that the large numbers of the 202 persons interviewed insist that this type of purposeful education and training in the

principles of applied science, mathematics and mechanics should provide for more rapid advancement in each occupation chosen. In some cases it was specified that these studies should include elementary organization problems concerning efficiency of management and the coordination of the various factors in industry. For example, such studies as building and equipment, purchase of materials, employment and supervision of workers, assembling and distribution of the products were suggested. In other words, those who are successfully engaged in professional, commercial and industrial occupations favor some sort of vocational emphasis in the senior high school, which is assumed where the "self-finding" emphasis exists in the intermediate or junior high school organization.

Vitalizing the Study of Machinery

Arthur B. Mays, University of Illinois

(Concluded from February)

The Engine Lathe

THE wood-turning lathe was one of the earliest machines invented. In its earliest form the lathe was a very crude machine, made entirely of wood. The power was delivered from a combination of bow, cord, and treadle, as shown in Figure 1. The cord was fastened to the bow string, wrapped once around the piece to be turned, then fastened to the end of the treadle. As the treadle was moved up and down, the

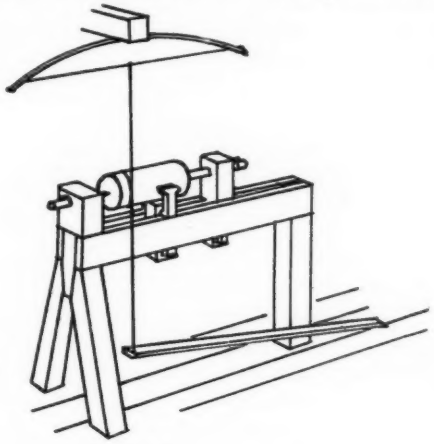


Fig. 1.

material was revolved first in one direction and then in the other. On the down stroke of the treadle the turning tool, held in the hands of the operator, was pressed against the revolving wood.

It is obvious that such an arrangement was not very satisfactory, and in the effort to devise a method of producing a continuous rotary motion in one direction, the improvement was made of placing a pulley in the head-stock, and thus by means of a belt, revolving the head-stock spindle to which the material was attached. (See Figure 2.) This was a tremendous step in the development of the turning lathe. When power machinery came into use, many minor improvements were made in the lathe, but there were no fundamental changes in the arrangement of parts, or principles of operation. The modern wood-turning lathe is merely a refinement of the old bow, cord and treadle lathe.

While it has not been necessary to carry the improvement of the lathe very far beyond the earliest designs for work in wood, early in the development of the *machine-tools* it was necessary to design a lathe which could perform much more exacting work than was possible on the wood turning lathe. Not only was a high degree of accuracy essential, but turning operations other than turning discs and cylinders had to be performed, such as cutting screw threads, both inside and outside, cutting mathematically perfect tapers, and truing holes in metals. To do this new type of work, it was found necessary to add various mechanisms to the lathe. The essential additions were; first, a mechanism for holding and feeding the tool, and second, a device for increasing the range of speeds of the head-stock spindle. The essential parts of an engine lathe, therefore, are, first, a device for holding and revolving the material to be turned; second, a device for holding and feeding the tool; third, a mechanism for increasing the range of speeds of the head-stock spindle, and fourth, a frame to support the various parts.

The Analysis

The power delivered to the lathe may come from a distant prime mover through a system of shafts, pulleys and belts; or from a motor mounted on the lathe and connected with the head-stock in the form of rotary

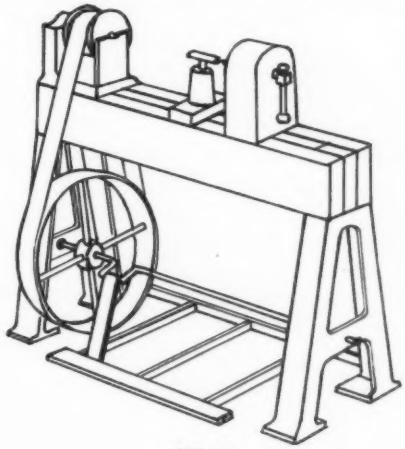
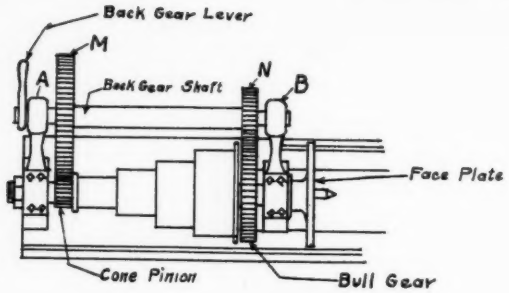
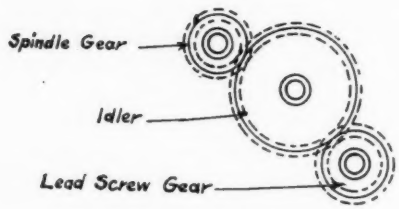


FIG. 2.

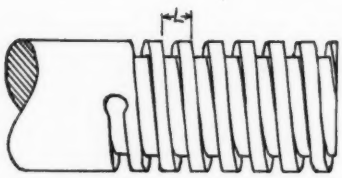
motion of a known rate of speed. It is with the modification, distribution and application of this power, thus delivered, that we are concerned in this study, and we shall consider the ordinary belt-driven lathe. It will be seen that the power delivered to the head-stock has to be



TOP VIEW OF HEADSTOCK



TRAIN OF CHANGE GEARS



LEAD SCREW

FIG. 3.

used for many different kinds of work and, therefore, there must be some way by which it can easily be modified. For some types of work a comparatively high speed is desirable, while for other classes of work very low speeds are necessary, and a number of intermediate speeds are also needed. Again it is evident that the power delivered to a lathe has to be used to perform widely different kinds of operations and at different places in the machine. It is necessary to distribute this power at carefully controlled rates of speed to the different parts of the machine. It is also clear that the power used to move the material must be applied in a quite different form from that used to move the tool, since the material revolves while the tool carriage slides. When work is being done, the power delivered to the cone pulley on the head-stock is divided in two main streams. One stream of power flows from the point of delivery to the material being worked, and the other stream is taken off through a train of gears, at the end of the lathe, to the lead screw, after which it undergoes a change of form from rotary motion to horizontal sliding motion. These two streams finally meet at the point of application, which is the point of contact between the cutting tool and the material.

The line of power running to the material may act directly on the material through the spindle, or it may be taken off from the cone pulley, through a back gear and then to the spindle. The latter method is used when lower speeds are desired than can be got from the direct connection of the cone pulley with the spindle. Since a small gear driving a large gear turns the latter at a much lower speed than the former, it can be seen how the back gear of a lathe greatly reduces the speed of the spindle. In the sketch, the cone pinion drives the gear M, and its shaft at a much reduced speed. In like manner the pinion, N, on the shaft with M, drives the bull gear on the spindle at a still further reduced speed. Hence, when the back gear of a lathe is used, the power delivered to the cone pulley undergoes two reductions in speed before it finally reaches the spindle and the material.

The line of power used to move the cutting tool along the material not only has to pass from a rotary motion to a sliding motion, but often it has to be applied at a speed exactly synchronized with that of the revolving material. This relating of the two speeds of motion is accomplished by connecting the lead screw with the head-stock spindle by means of a train of gears. A simple arrangement of this gear train is shown in the sketch above. If, for example, a thread is being cut on the material and it is necessary for the lead screw to turn half as fast as the spindle, by placing a change gear on the lead screw having twice as many teeth as the spindle gear, every revolution of the lead screw gear will require two revolutions of the spindle gear. The idler, of course, in no way affects the relation of the driving and driven gears. For many relations of speed the "compounding" of gears is necessary, but the principle is the same as in the case illustrated. When an exact relation of the speed of the tool to that of material is not needed, the lead screw and the spindle may be connected by a small belt running on cone pulleys. Some lathes are provided with both a lead screw and a drive rod, using the lead screw only for screw cutting work. In such cases, the drive rod is connected with the spindle by a belt, while the lead screw is connected by a train of gears.

As was stated above, the power delivered to the lead screw, or to the drive rod, before it is finally applied, has to be converted to a horizontal sliding motion. This conversion is accomplished, in the case of the lead screw,

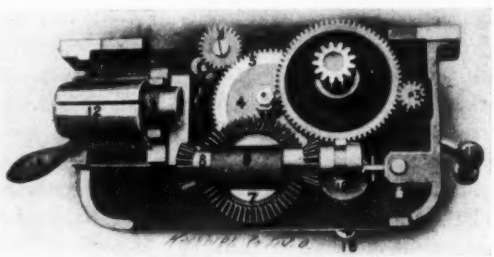


FIG. 3 A.

1—Rack gear. 2—Cross feed gear. 3—Apron bush gear. 4—Friction plate. 6—14-tooth gear attached to friction plate. 7—Large bevel gear. 8—Rod sleeve. 9—Rod bearing. 10—Small bevel gear. 11—Bevel gear attached to shifter. 12—Lead screw nut. 13—Nut plate. 14—Nut eccentric. 15—Handle for longitudinal feed. 16—Handle for reverse. 17—Tumbler plate. 18—Shifter fork.

by means of a split nut on the inside of the tool carriage. In the illustration, this nut is marked "12," and it will be seen that, when the lead screw is not in use, the nut is opened. When the carriage is to be moved by the lead screw, the nut is closed about it, and for every revolution of the lead screw, the carriage will be made to slide the length of the lead of the screw. When the carriage is to be driven by the drive rod, a system of gears is used. The rod runs through sleeve "8" and bearing "9" and is fastened to "8" by means of a groove and spline, the groove running nearly the entire length of the rod, thus permitting the sleeve to move freely along the rod. By moving the sleeve "8" to the right or left, according to the direction of movement of the carriage desired, either bevel gear "10" or "11" is meshed with the large bevel gear "7." In either case, the revolutions of "7" are transmitted finally to the pinion on gear "1," which works on a rack on the under side of the ways. Thus the revolution of the drive rod moves the carriage along the ways.

By dividing the original flow of the power delivered to the head-stock in these two streams, the work of the engine lathe is performed. The stream which is led off through the spindle gear, the change gears, the lead screw and the carriage, moves the cutting tool, while the stream which runs from the original point of entry either round through the back gear or directly through the spindle to the material, revolves the material against the edge of the cutting tool, and thus the two streams meet, at the point of final application of power.

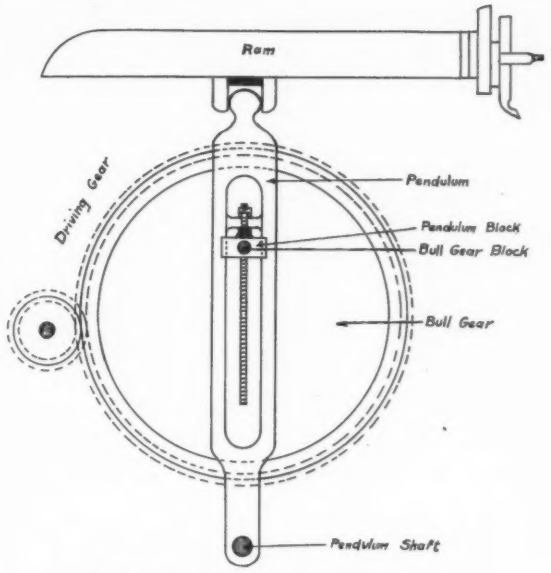
The Crank Shaper

One of the most interesting machine tools to be found in a modern machine shop is the crank shaper. It is interesting because of the unique method employed of transforming the rotary motion, delivered to the machine, to the reciprocating motion at the point of application of power.

The Analysis

Power is delivered to the shaper in the form of rotary motion at a cone pulley below and at the rear of the machine. It then passes through a pinion on the same shaft with the cone pulley, to a large spur gear, called the bull gear, in the inside of the machine body. There is a projection or bull-gear block attached to the web of the bull gear in such a manner that it can be moved to any position on the diameter of the gear. This block works in a slot in a long beam, called the pendulum, which has its pivot at the bottom of the machine, and which has its upper end projecting into an opening in the big ram on top of the machine which holds the cutting tool. By reference to Figure 4, it will be seen that the pendulum is a simple lever of the third order, and that the length of the stroke of the ram is determined by the degree of eccentricity of the bull-gear block. Hence, when the bull gear revolves, the bull-gear block causes the pendulum to swing forward and backward imparting a reciprocating motion to the ram.

All the power delivered to the cone pulley, however, does not pass over the route described, as part of it is



By revolving the bull gear, the pendulum will be made to rock on its shaft, and the ram will be moved backward and forward.

FIG. 4.

taken off after being delivered to the bull gear. This line of power passes to the pinion at the outside end of the bull-gear shaft, then to a small gear, which turns a disc having a slot running across it, along its diameter. This slot permits the change of eccentricity of revolution of a stud bolt in it. From the stud the power passes along a rod to a small rocker arm, which works on its spindle with a ratchet, allowing the reciprocating movements of the arm to turn the spindle in only one direction. From this spindle, the power passes by means of a spur gear to either one of two pinions. One of these operates a screw which moves the table horizontally, the other, by means of a horizontal shaft and a vertical screw, connected by bevel pinions, operates the table vertically. Hence it is seen that this line of power leaves the main line at the bull gear, and by a most indirect route finally terminates at the point of contact between the tool and the material which is fastened to the table. By the use of back gears the main line of power reaches the bull gear by a path leading from the cone pulley through the back gear. But in the usual type of crank shaper, the lines of power follow the paths described and shown in the sketches. The division of power in two streams, one to move the material and the other to move the tool, is the typical condition of the machine tool.

The Sewing Machine

Sewing has always been one of the most tedious operations man has been called on to perform for the satisfaction of human needs. Through all the ages it has fallen mainly to the lot of women to perform this work, and up to a comparatively few years ago all sewing had to be done by the slow hand methods. But with the development of machinery, and the enormously increased demand for garments of every description, for shoes, harnesses, and saddles, we find men working on

the problem of performing this necessary operation on machines. Before the sewing machine, as we now know it in all its various forms was perfected, men had been experimenting for over a hundred years trying to develop such a machine.

There are now many different types of sewing machines and a detailed description of any one machine would not describe any other type, but all sewing machines have in common a general principle of operation.

The Analysis

Whatever the type of machine its work is, first, to perforate the material worked on, and second, to run thread through the perforations in such a way as to form a stitch, which will hold together the pieces of material. In making the stitch, three distinct operations have to be performed; first, a needle perforates the material and carries a loop of thread through the perforation; second, a shuttle, or hook, carrying a bobbin wound with thread, engages the loop attached to the needle in such a way as to pass the thread from the bobbin through the loop,

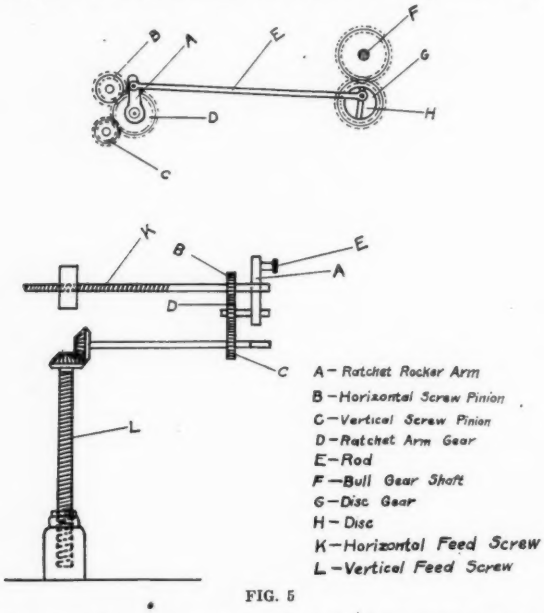


FIG. 5

thus forming the stitch; and third, the material being sewed is fed under the needle at accurately regulated intervals.

There are, therefore, three distinct lines of force meeting at the point where the stitch is formed. The power of the familiar type of sewing machine is delivered at the treadle, and passes through a pitman, fastened to one corner of the treadle, to a crank on the shaft of a large wheel. By means of a leather band it then passes to a small hand wheel on the arm-shaft of the machine. From the arm-shaft two lines of power are taken off by means of a cam and a crank, usually. At this point the rotary motion of the shaft is transformed to a rocking motion, usually in two linkage connections which operate shafts running under the bed of the machine. One of these shafts, either through

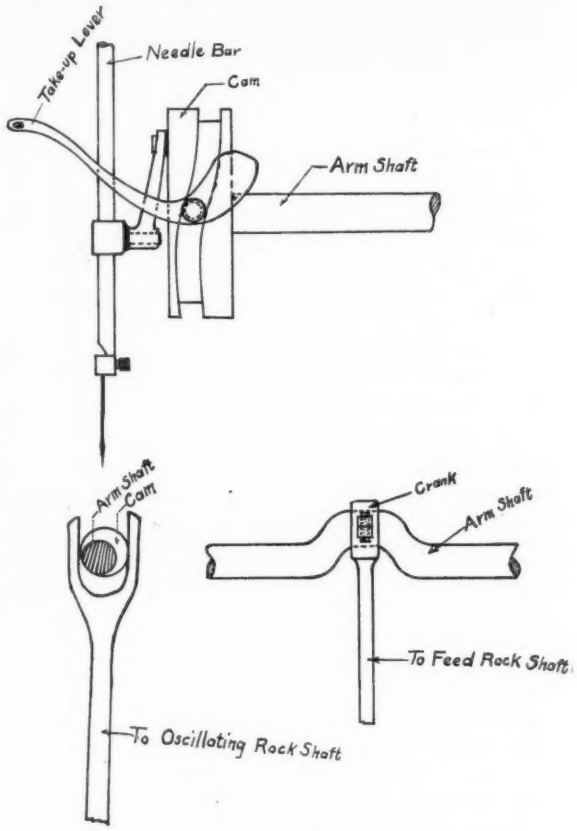


FIG. 6.

some form of linkage, or cams and rods, operates the feed dog, while the other shaft by similar means operates the shuttle. Through one of these lines, then, a part of the power flows to the feed dog, and through the other line a part flows to the hook or shuttle.

Part of the power delivered in the arm-shaft passes on to the end of the shaft where, by means of a crank and link, it raises and lowers the needle bar, thus passing finally to the point of application where the needle passes through the material. Near the end of the arm-shaft a fourth line of power is taken off by a cylindrical cam and an oscillating arm, which by means of a hole near its outer end, "takes up" the thread which runs through the needle.

There are many types of foot-power sewing machines and many types of power machines, but the three main lines of power are to be found on most of them, while on some the power entering the arm-shaft is divided in a great number of different lines.

Summary

In this brief study of three familiar machines, each embodying some distinct principle in power application, or in the method of the distribution of power through the machine, several important ideas for discussion appear. In the first place, it is evident that a machine is not a haphazard, inexplicable mass of gears, levers, cams, bolts, screws, etc., but is a carefully worked out combination of mechanical elements, and is designed to perform in most accurate fashion, very definite tasks.

It is very clear, also, that none of the machines studied could possibly have sprung into existence full-grown, but that each must have come to its present degree of perfection after many minds had been engaged in its development, and many years spent in experimenting and discovering defects and needed improvements. Since man has comparatively little to do in the actual work of these machines, aside from the general control of the entrance of power to the machine and in the adjusting of working parts, it can easily be seen that he has gradually come to do less and less of the work now performed by the machine. As has already been suggested in the case of the earliest machines marking the first steps of the transition from hand tool to machine work, man furnished the motive power either by means of foot treadles or by turning a crank or wheel by hand, and also performed one of the two fundamental operations of machine work, that of holding and feeding, either the material, or the tool. The next step in the transition of hand tool processes is the application of power to the man driven machine, thus releasing the operator to give all of his attention to the feeding of tool or material. The third step in the evolution is the addition to the machine of mechanisms which perform the work formerly done by the operator, that is the feeding of tool or material, thus leaving him merely the task of setting the material in place, adjusting the tool, regulating the speeds and feeds, and starting and stopping the machine. In machines which are nearest to being completely automatic, the operator has only to perform some one or two of these functions.

As soon as the third step is reached in machine development, the problem of the division of power delivered to the machine is introduced, and the meaning of the very design of the machine is explained in the division, control and modifications of the lines of power. When the main line of power becomes divided, the machine begins to be complicated. When further division occurs, greater complication is introduced, therefore, the first important knowledge needed in analyzing any machine is not to know the types of mechanisms and their mathematical relations, but it is to know clearly the paths over which the power delivered to the machine travels in its various movements to the final point of application, where the tool meets the material. When this is traced out and understood, then the question of just the *how* and the *why* of the controls of these streams of power is raised, and there develops a strong motivation for its solution, which usually does not exist before. Therefore, in the analysis of machinery and in the study of the principles of mechanisms, before the consideration of a formulae and of mechanical efficiency, there should first come a study of the machine as an active, working unit with a living force flowing through it. This force moves from a definite place of entry, over various paths, at accurately controlled speeds, finally reaching the point of application, where the work of the machine is performed. Such a study gives the unifying element for the further detailed study of machines, and gives the key to the historical development of modern machinery.

The Decorative Border as a Design Problem

A. G. Pelikan, Instructor in Drawing and Painting, University of Michigan.

WHEN man discovered that by interlacing different colored grasses he was able to obtain a rhythmic repetition of motives pleasing to him, he began to develop this discovery further by consciously repeating motives and borders in weaving, wood notching, and in personal adornments.

Later on, when the Greeks added the fret, the meander, the egg and dart moulding, dentils, and triglyphs, they brought this rhythmic repetition to such a state of excellence, that we have continued to make use of their design motives ever since.

If we stop to analyze any decorative border, we find that a great deal of its interest depends on joint action, movement, or continuity. The eye follows the rhythmic or orderly movement of line in much the same way that it follows and enjoys the movement of the waves, or the ripples of water caused by the wind or by an object thrown into still water.

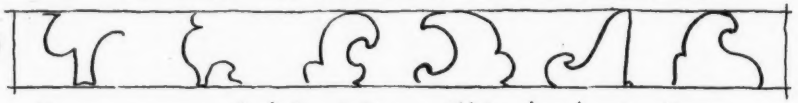
We do not enjoy the hop-skip, and jump effect of some borders for the same reason that we do not enjoy the clicking of a telegraph instrument as a satisfying auditory sensation. As far as the repetition of sound is concerned, it is a meaningless jumble. On the other hand, the extremely regular and monotonous ticking of a clock becomes tiresome, on account of the incessant repetition without variation.

A certain amount of restraint is more important than the attempt at over-elaboration. The overworked design may be compared to the verbose person who says, "my abdomen acquaints me of its vacuity," instead of saying "I am hungry."

I have sat in the native huts of the Polynesians and listened for hours, with the greatest enjoyment, to their low chanting, which is confined to a scale of about eight tones. This is used so harmoniously and variedly as to cause one to wonder at the seemingly inexhaustible possibilities of this limited scale. Similarly a design may be developed from a simple element and by repetition, opposition, inversion, notan and color, be made into an interesting unit. Plate No. 1 shows in detail the development of a border, while plate No. 2 shows a group of borders which were developed in a similar manner.

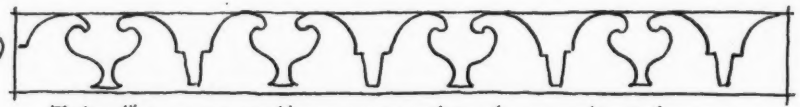
The manual training teacher who uses a few curves in an endless variety of combinations in his cyma rectas, cavetto, ovolo, and other mouldings, is often at a loss

THE DEVELOPMENT OF A BORDER. No 1



Draw a series of abstract lines within two border lines

Pick out one of these motives and repeat by connecting



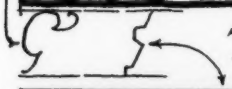
Take the same motive - oppose it and repeat again

Add space fillers where necessary

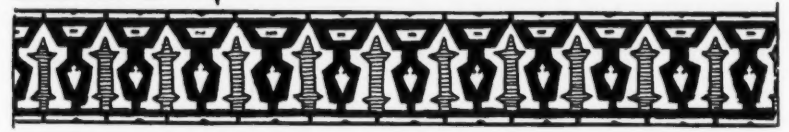
Interpret in three values This may next be carried out in three colors

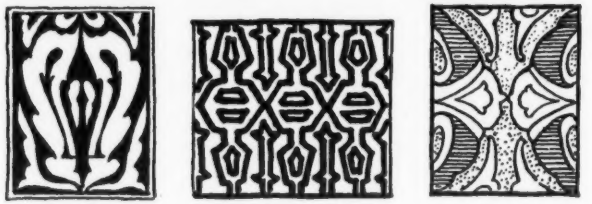
THE DEVELOPMENT OF BORDERS No 2.

Upper Border developed from line shown



Two lines from which borders were developed





what to do, when a simple original, carved horizontal border is needed. It may be well for the teachers of domestic science, manual training and printing, to give their students a problem involving the practical application of a border, and have them design it in terms of the medium in which it is to be executed.

The problem should not be merely the designing of a border, but should in some way, demonstrate to the student how borders have been used in the past, how they are now being used in architecture, metal work, printing, interior decoration, dress and furniture, and how the principles applying to the designing of a border also apply to other good examples of industrial art.

A little application, with an occasional explanation of what to look for, will enable students to use their eyes intelligently and to open hitherto unknown avenues of pleasure to them.

An Analysis of Part-Time Laws Enacted By the States[1]

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PART-TIME education may mean various things to various people, so in order to have a definite understanding of the term as far as this paper is concerned, the term part-time education will be defined. Part-time education is work carried on, for a limited number of hours, during the working day in schools, factories, stores and shops.

Part-time work is divided into three types of work as follows: general continuation, when the object is to continue the general education of the boy or girl; trade preparatory, when the object is to increase the skill and intelligence of the boy or girl in an occupation other than the one in which the boy or girl is engaged in; trade extension, when the work given is supplementary to the daily work.

Twenty-seven states have passed part-time laws. The names of the states having passed part-time laws follow:

Arizona	Maine	New York
California	Massachusetts	Ohio
Connecticut	Michigan	Oklahoma
Delaware	Missouri	Oregon
Florida	Montana	Pennsylvania
Illinois	Nebraska	Utah
Indiana	Nevada	Washington
Iowa	New Jersey	West Virginia
Kentucky	New Mexico	Wisconsin

Of these States, Maine alone has a purely voluntary type of part-time law. Indiana, Ohio, Michigan, New York, and Massachusetts, have enacted part-time laws which are known as permissive-mandatory or permissive-compulsory. All of the other states have the compulsory part-time laws, which have been the most effective in operation. The distribution of the states which have passed part-time laws is shown in Chart number one. The chart shows that the southern states as a whole have not passed part-time laws of any kind. This may be due possibly to the lack of industrial pursuits in those states. The same can be said of the other states not having part-time laws, although the agricultural interests should be represented in this entire group.

The part-time laws will be presented for discussion under the following headings:

1. Age Limits
2. Types of Laws
3. Minimum Number of Students Required
4. Required Time of Attendance
5. Number of Hours Required per Week
6. Length of School Year
7. Pay for Time in School
8. Penalties for Violations
9. Persons Subject to Penalties
10. Who Administers Law?
11. Amount of Support for Instruction
12. Time of Holding Classes

The data gathered under these headings is found in Table 1.

The first topic to be discussed is the age limits or period of required attendance. The matter of attendance is an individual problem for each State because of the variations in the compulsory attendance laws for the full-time schools and economic conditions. Specific minimum and maximum age limits cannot be laid down for all states but a summary of laws passed can be cited and these taken as criteria.

In all of the states having passed part-time laws, except Delaware and Oklahoma, the minimum of 14 years is found. Delaware's lower age limit is twelve and Oklahoma's lower age limit is 16 years. The state compulsory school law in Delaware lets the child out of compulsory attendance at 12 years of age, while in Oklahoma the child is required to attend until 16 years of age. Oklahoma represents the common trend in educational thought, that of extending full-time school attendance.

The highest age limit is 18 years which is found in twelve states. In twelve states, 16 years is the maximum age limit. One state, namely Washington, has a maximum age limit of 16 years. Florida sets a minimum age limit of 14 years but does not set a maximum age limit, and Maine is governed by general educational laws as the state part-time law is purely voluntary.

The next topic to be discussed is the types of part-time laws as passed. As stated in this paper above, Maine has a purely voluntary type of part-time law. Indiana, Ohio, Michigan, New York and Massachusetts have permissive-mandatory or compulsory type of part-time laws while the others have the compulsory type. The purely voluntary type leaves the matter to the community as to whether part-time schools shall be estab-

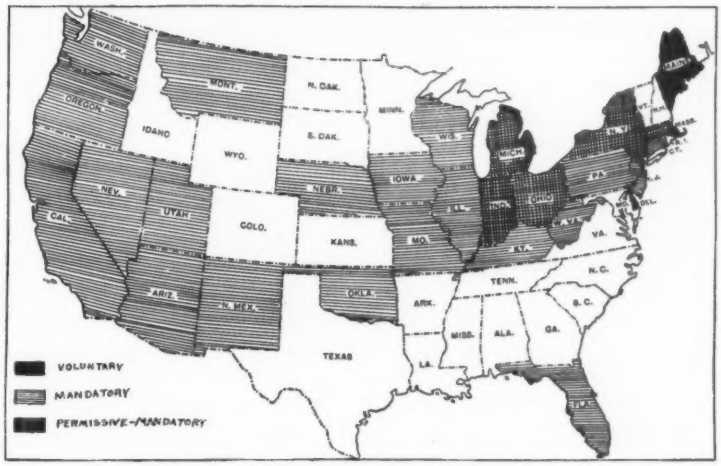
[1]Data taken from Federal Bulletins and State Part-Time Laws.

TABLE I

NOTE—In all the states attendance is required during the working day. Classes are held during the working day. Pay for time in school is not compulsory.

STATES	Age Limits	Types of Law	Minimum Number of Students	Number of Hours per Week	Length of School Year	Penalties	Persons Subject to Penalties	Who Administers Law	Amount of Support for Instruction
Arizona	14-16	Comp.	15	5	150 hours	Min., $5 Max., 50	Parent Employer	State Board	75% of Salaries
California	14-18	Comp.	12	4	Same as Public Schools	Min., $50 Max., 200	Parent Employer	State Board	
Connecticut	14-16	Comp.	..	4	Same as Public Schools			State Board	
Delaware	12-16	Comp.	15	4	Same as Public Schools			State Board	
Florida	14	Comp.	15	..	144 hours	No penalty		State Board	
Illinois	14-18	Comp.	20	8	Same as Public Schools	Min., $5 Max., 100 } Par. Min., $25 Max., 200 } Emp.	Parent Employer	State Board	50% of Money Expended
Indiana	14-18	Perm. Comp.	..	4 or 8	Same as Public Schools	Min., $10 Max., 50 } Par. Min., $40 Max., 100 } Emp.		State Board	
Iowa	14-16	Comp.	15	8	Same as Public Schools		Parent Employer	State Board	½ Money Expended
Kentucky	14-16	Comp.	..	..				State Board	
Maine		Voluntary	..	..				Cities and Towns	
Massachusetts	14-16	Perm. Comp.	200	4	Same as Public Schools	30 days Min., $10 Max., 100 } Emp. Withhold funds	Employer City or Town	State Board	½ Money Expended
Michigan	14-18	Perm. Comp.	50	8	Same as Public Schools	Min., $10 Max., 100 } Emp.	Employer	State Board	
Montana	14-18	Comp.	15	4	Same as Public Schools	Min., $5 Max., 20 } Par. Min., $25 Max., 50 } Emp.	Parent Employer	State Board	50% of Money Expended
Nebraska	14-16	Comp.	15	8	144 hours	Min., $5 Max., 20	Employer	State Board	¾ of Money Expended
Missouri	14-16	Comp.	25	4	Same as Public Schools	Same as for General Education	Same as for General Education	State Board	½ Money Expended
Nevada	14-18	Comp.	15	4	Same as Public Schools	Min., $5 Max., 25 } Par. Min., $50 Max., 100 } Emp. 3 years min.		State Commissioner of Education	
New Jersey	14-16	Comp.	20	6	36 weeks		Parent	State Board	
New Mexico	14-16	Comp.	15	5	150 hours	Min., $5 Max., 100 } Par. Min., $5 Max., 50 } Emp.	Parent Employer	State Board	⅔ off inst. teacher not to exceed $1,000. Each add. ½ not over $1,000
New York	14-18	Perm. Comp.	20	4 or 8	Same as Public Schools	90 days Min., $25 Max., 100 5 to 10 days Forfeit funds	Employer City or School District		
Ohio	14-18	Perm. Comp.	..	8	144 hours			Com. of Ed. Regents of Univ.	50% of Money Expended
Oklahoma	16-18	Comp.	20	..	144 hours	Ordinary School Pen. } P. Min., $25 Max., 50 } Emp.	Parent Employer	State Board	
Oregon	14-18	Comp.	15	5	Same as Public Schools	Min., $5 Max., 25 2 to 10 days	Parent School Officers	State Board	
Pennsylvania	14-16	Comp.	30	8	Same as Public Schools	Min., $10 Max., 100 } Par. Min., $10 Max., 25 } Emp. 10 days	Parent Employer	Local Board	50% of Money Expended
Utah	14-18	Comp.	15	4	144 hours	Misdemeanor	Parent Employer	State Board	Reimburse
Washington	14-17	Comp.	15	4	Same as Public Schools	Misdemeanor	Parent Employer	State Board	50% of Money Expended
West Virginia	14-16	Comp.	50	8	144 hours	Withhold funds	School District	State Board	Reimburse
Wisconsin	14-18	Comp.	..	8	8 months	Min., $5 Max., 25 } Par. Min., $10 Max., 100 } Emp.	Parent Employer	State Board	50% of Money Expended

lished and kept running. The permissive-mandatory type leaves the establishment of part-time schools to the local community, but when once established they must be kept up, the compulsory type leaves nothing to the local community. Classes must be started where a certain definite number of people of part-time age are working and the classes must be kept running as long as there are students to instruct. The last type is more generally adopted and works out to better advantage for all concerned.



THE PART TIME LAWS IN THE SEVERAL STATES.

There is considerable difference in the minimum number of students required to establish part-time classes. The Massachusetts law states that part-time classes may be established in cities where there are 200 or more students of part-time school age. The California law states that part-time classes must be established where there are twelve or more students of part-time age. This is the smallest minimum number of students required to establish part-time classes. Two states, Michigan and West Virginia, require a minimum of 50 students, while Missouri requires 25, and Pennsylvania, 30 students. There are eleven states requiring a minimum of fifteen students and four states requiring 20. From the discussion above the fact stands forth that the greater number of states require a maximum of fifteen students for the establishment of part-time classes.

Topic number 4 "Required Time of Attendance" and topic number 12, "Time of Holding Classes" are the same so will be discussed as a single topic in this paragraph. Without exception the class work must be done during the working day. Evening classes are accepted as part-time classes when they are held during the student's working day, as in the case of night workers.

The number of hours per week required ranges from four hours to eight hours. There are eleven states requiring four hours of work per week. There are ten requiring eight hours per week, three requiring five hours, and one state requiring six hours. This shows that four and eight hours are the common requirements for part-time work per week with 5.5 hours per week as a median.

The common practice in determining the length of the part-time school year is to run it parallel with the regular public schools. Fourteen states determine the length of their part-time school year in this manner. Six states require 144 clock hours to be put in at the rate of four or eight hours per week, or eight hours per day as in the dull season classes. Arizona and New Mexico require 150 hours per week, Wisconsin requires eight months and New Jersey 36 weeks. It can be plainly seen that the length of the part-time school year is approximately the same, in hours, for all of the states having part-time laws.

No state having part-time laws makes it compulsory for the employer to pay the employee while he is at the part-time school. In practice the employer, in practically every case, pays the student for the time he is working in the part-time school. The average employer realizes that increased training usually means increased efficiency and therefore a speeding up of production. If the law required the employer to pay the employee while in the part-time school, in all probability, the employer would either get rid of the boys of part-time school age or would reduce their pay. The employer does not like to feel that he is forced to do anything.

There are three common penalties for violations of the part-time laws which are as follows:

1. Minimum and maximum fines.
2. Workhouse sentences.
3. Withholding state support.

Most of the states have minimum and maximum fines or workhouse sentences or both, while a very few have the power to withhold state support.

The employer and parent or guardian, in most cases, are the ones liable to the penalties. New York penalizes the city or school district as does West Virginia and Massachusetts. Pennsylvania, in addition to the penalty upon parents, guardians and employers, also puts a penalty upon school officials for failure to do certain specified things. In no case is the student penalized, except in the case of incorrigibles, which comes under the regular local laws.

The common practice in the administration of part-time schools is for state administration. Massachusetts and Pennsylvania give the power of administration to the city or town or local board. New York puts power of administration in the hands of the Commissioner of Education and the Regents of the University. These three states are the only deviations from state administration.

The Smith-Hughes law provides that money can be given to the states only as reimbursement for the salaries

of the instructors. The Federal Board will match dollar for dollar put up by the state but it specifies that this money must be expended for instructors' salaries only. In most cases, the state reimburses the local board or community to the extent of fifty per cent of the instructional cost. There are certain exceptions, however, New Jersey being one which gives $4,000 to the locality for each instructor in the part-time school. Arizona is another exception which reimburses the local board or community to the extent of two-thirds of the first teacher's salary, not to exceed $1,000 each per annum. As can be plainly seen, the common practice is to reimburse the local board or community to the extent of fifty per cent of the instructional cost.

The foregoing discussion relates to the groups most common to the part-time laws which have been passed by the various states up to the present time. Other groups or sections, written into the laws of a few states, are as follows:

Census of Minors
Courses of Study
Substitute Attendance
Initiative and Referendum
Exemption from Establishing Part-Time Schools

Part-time education has become a very important part of our public-school system and is here to stay so in order to teach, supervise or administer part-time work one must be familiar with, and understand, the structure of part-time laws as well as the difficulties. This brief sumary of part-time laws gives one a very good idea of the complexity of the making and administering of part-time laws.

Pattern-Making for First-Year Trade Classes

T. B. McGraw and John F. Faber, Erie, Pa.

Pattern-making, as a trade study, is fast taking its proper place in the school curriculum. The benefits of its stability as a hand trade are not affected to any marked degree by the invention of modern machinery, and its demand for labor in all seasons of the year makes it a popular choice of the intelligent trade school boy.

The value of the trade school courses where the boy is led through the difficult processes or operations, compared with the older apprenticeship system where the mechanic very often stumbled into his trade, needs no verification here. However, the choice and arrangement of jobs, method of presentation, and related information taught and used successfully in one school may be of interest to those dealing with these problems.

Methods in Vogue

The method of putting a beginning class at production work on machines will not satisfactorily solve the problem of teaching pattern-making for it usually results in no regular sequence of operations or use of tools; no assurance that even the surface of each branch of the trade has been scratched; much expense through needless loss of material and time; inefficient instruction because of the difficulty to properly arrange a course of study; and danger to the machines and particularly to the student, who is not familiar enough with the machines to use them properly in making the patterns for a new machine.

The method of making patterns from models, perspective drawings, or drawings showing the construction of the pattern, whether these drawings be in book or blueprint form is also undesirable. It does develop manipulative skill but deprives the student of the thought, initiative, and visualization in three dimensions, which are so necessary to the good mechanic.

Choice of Method

The method used in the Erie schools attempts to approach as nearly as possible the actual conditions encountered in a commercial pattern shop where the boy will find himself after graduation.

The trade is divided into its main units and arranged according to the degree of learning difficulty involved.

When the work was first undertaken the shops of the city were solicited for suitable problems for each unit. These were drawn in orthographic projection by a trade drafting class, not by the pattern-making class. This brings these particular drawings before the pattern-making class for the first time in the shop. In this way actual shop practice is introduced.

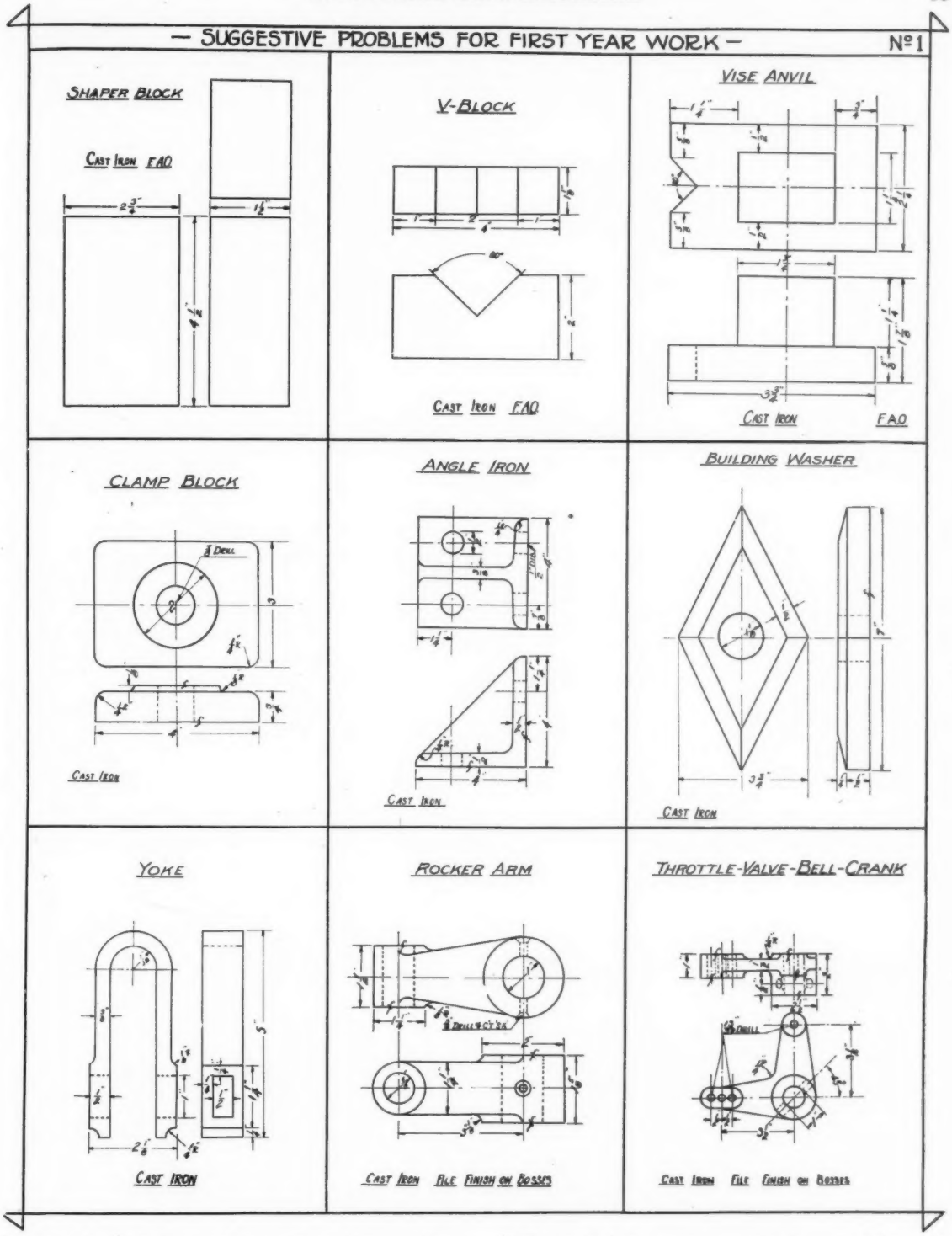
These jobs were arranged under each unit in their proper sequence. A few are shown on charts one and two. The sizes were reduced so as to minimize cost and allow the use of scrap stock in many instances.

The above procedure not only overcame all the objections of the two former methods but had the advantage of training for active employment in the pattern shops of the city. It was possible to embrace a good part of the pattern-maker's trade on small jobs with this method. Where no jobs could be obtained to cover a certain unit, they were supplied by the instructor.

After the first year class has gained sufficient experience in the underlying principles of the trade to proceed with a fair degree of skill, the production work on machines for the school system is attempted. The greater part of this, however, is covered by the second-year class which will be offered in another article.

Scope of Work Covered

Perhaps one of the foremost essentials of a good mechanic is his ability to interpret working drawings. This part of the student's training is stressed in both the drafting room and shop. When a beginning class has had no previous experience in reading drawings, the orthographic drawings are placed on the shop blackboard in perspective, for the first few weeks, which limits the work in the shop to bench pattern-making. During this time the mechanical drafting instructor meets the class for four hours each week and develops the ability to visualize simple drawings through an intensive short unit course in freehand orthographic sketching. When

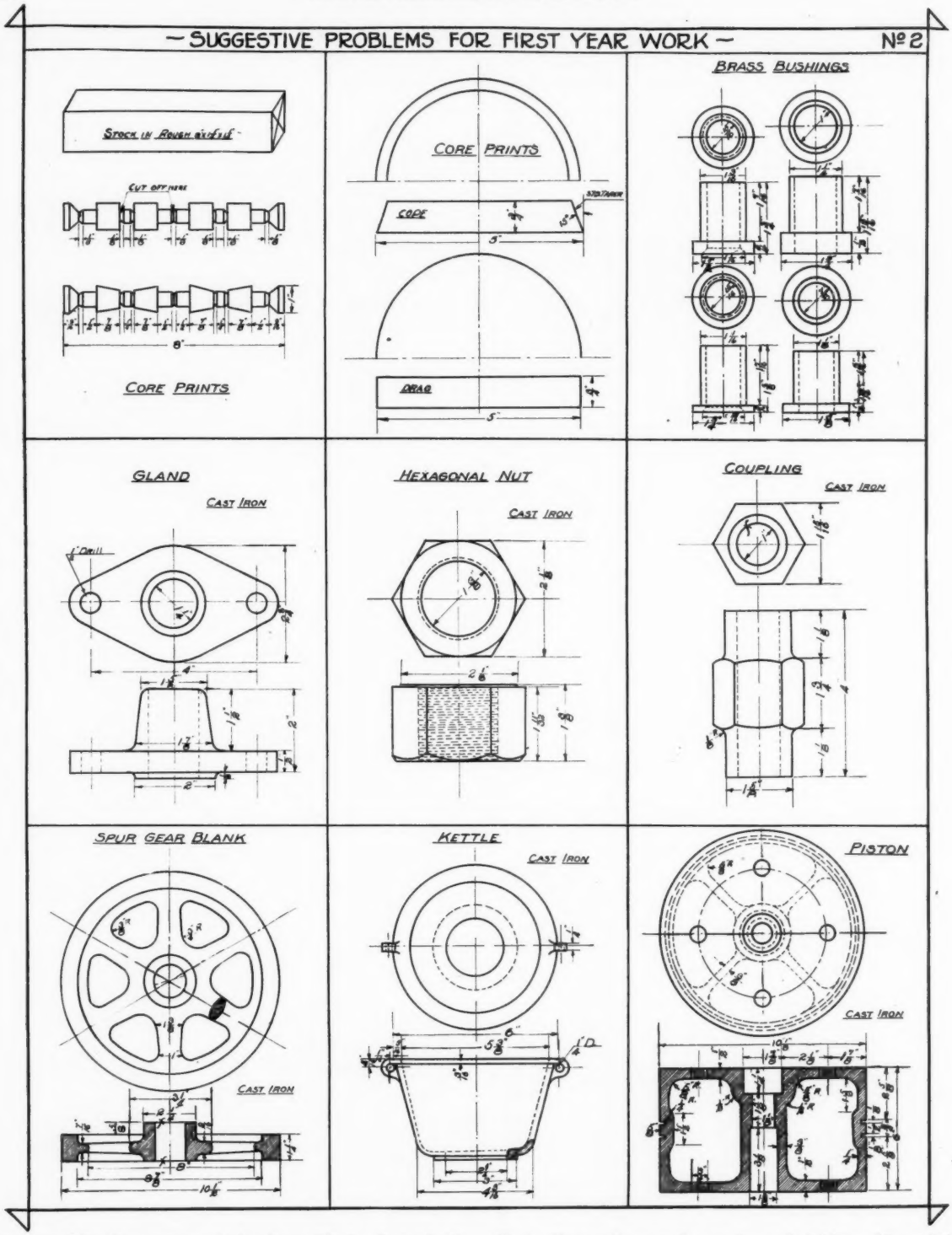


this point is reached no assistance through perspectives is given in the shop, leaving the thinking in three dimensions to the student.

The aims of the first year's work are to teach the best methods of pattern construction, the care and use of bench tools, the principles of bench molding and simple core-making, and the care and use of wood-working machinery. The power of visualization, skill, and accuracy are developed.

The principal processes covered are getting out stock, planing (hand and machine), measuring, testing, squaring up stock, sanding (hand and machine), rounding corners, centering, sawing (hand and machine), grinding and sharpening tools, fitting, turning between centers and on faceplates, carving, laying out, building up segments, and templet-making.

Manipulative skill is acquired through the use of the following tools; shrinkage rule, gauge, knife, divid-



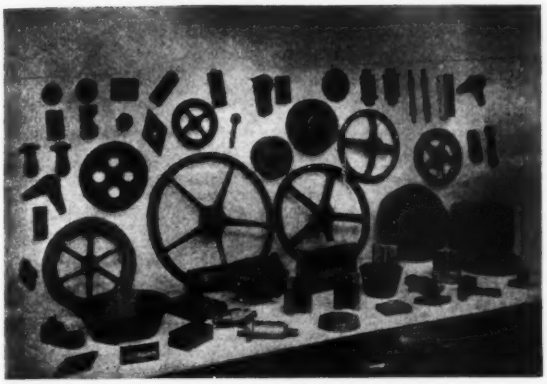
ers, combination square, jack plane, block plane, back saw, chisels, gouges, corner rounding tools, calipers, turning tools, protractor, scribers, spoke shave, depth gauge, and straight edge.

The machines involved are the band saw, trimmer, sander, variety saw, surfacer, thickness planer, grinder, lathes, and drill press.

The related information covers molding in its application to pattern-making; machine shop practice as it affects the pattern-maker; shop sketching, blueprint reading and layouts; science as it touches lumbering, glue, oil and grinding stones, shellac, alcohol and strength of materials; and safety first through guards for the machines and bulletins from the national society.

Molding and Shop Visits

The principles of molding are taught during the two-year course through shop visits to commercial foundries and by molding in the school shop. A small



TYPICAL PATTERNS MADE BY THE CLASSES.

molding bench offers an opportunity to make lead castings from students' patterns to impress the necessity of draft, methods of molding, parting, sands, cores, gates, and pouring.

The shop visits are usually preceded with a lesson on the kind of a foundry to be visited, and what to expect. During the first year a grey iron and steel foundry are visited.

A mimeographed list of suggestions[1] is furnished each student making the shop visit, which acts as a guide in obtaining the desired information. A sample of such a list for use in visiting a grey iron foundry follows:

Notes on Shop Visit to Cascade Foundry

1. The Cascade Foundry, one of Erie's largest jobbing grey iron foundries, is located at Nineteenth and Cascade streets. This foundry makes castings for any firm, or individual, desiring them. At normal times from one hundred and fifty to two hundred men are employed.

In going through this foundry remember you are a guest of the firm and conduct yourself accordingly.

Do not interfere with the men in any way that will hold up production. Remember some of the men may be working on piece work, and if you interfere with their work they lose that much time and time is money to them.

2. **Cautions:** Be careful not to stumble over any molds. Keep out of the way of the traveling crane. If the men are "pouring off" be careful not to get in the way of those carrying metal.

[1]Mr. E. L. Bowman made the first list of suggestions used in Erie for a shop visit.

3. **What to observe in foundry:**

1. How does the sand used in this foundry compare with what we use?

2. What is used for making partings?

3. How many different methods are used in ramming up molds?

4. How are the patterns gated?

5. What are the names of some of the gates?

6. Why do they riddle the sand around the pattern in the mold?

7. Note how the molding machines operate.

8. Note what kind of patterns are used in the molding machine.

9. Note if all the patterns used are made of wood.

10. What makes the sand hold together in molding?

11. Note how some of the large patterns are molded; drawn from sand, etc.

12. Why do they place an iron plate on each mold before pouring metal into the mold?

4. **Cupola:**

1. Note the shape of the cupola, how constructed, capacity, how filled, what prevents it from burning out, how tapped, plugged.

2. Note kinds of ladles used.

3. Note the fire burning in large ladle. (What is this for?)

4. Note the tuyeres on cupola. What are they used for?

5. **Pouring the Heat:** Watch, especially, to keep out of the way of men and metal. Keep your eyes protected if the metal begins to fly. Note the tapping out of the molten metal, the use of the ladle and the slagging off of the cupola. This last is a new process done by two men. Note the shank and the bull ladles. Note how the molds are weighted before pouring. Why? Note that two molders pour at once on most of the molds. Why? Watch for the men shaking out the molds as soon as the metal has cooled enough for this purpose.

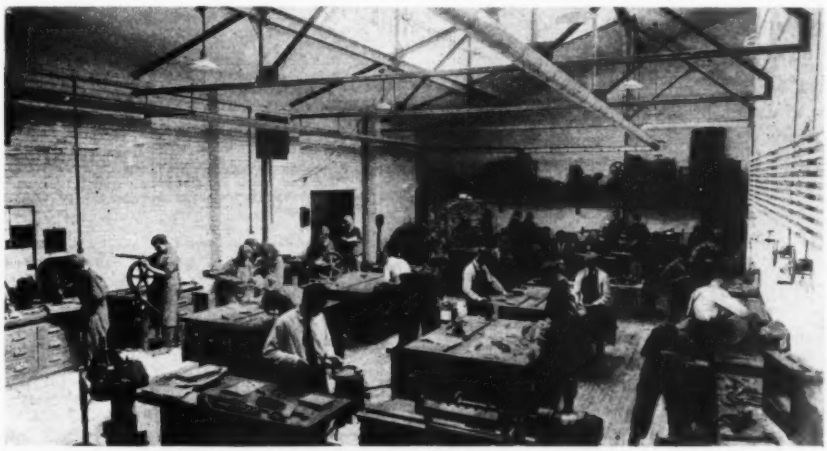
6. **Core Room:** Note how sand is mixed. Note how cores are made, vented, rapped, dumped from boxes, dried, pasted together and blackened.

Cleaning Room: Note how castings are cleaned. What makes them so smooth? How many different methods are used to clean castings?

Pattern Storage: Note how patterns are stored when not in use.

The lesson following a shop visit each student is given an opportunity to answer the above questions. Through the class discussion which follows a general idea of molding in grey iron is acquired.

The cuts accompanying this article give an idea of the pattern shop at Academy High School and an exhibit of patterns made by first-year trade school students.



A PATTERN CLASS AT WORK.

Manual Arts Analysis and Lesson Plans

John R. Holliday, Richmond, Va.

IN TEACHING a trade, the first step in the teaching "job" is analysis; i. e., trade analysis. How far can we use these methods of trade analysis in the elementary manual arts field? The former is vocational education toward acquisition of skill, and that, applied to the earning of a livelihood, the latter a part of general education toward industrial intelligence. Has the "job" the same significance in the manual arts field as it has in the vocational field of trade analysis? The difference in the two subjects, then is evident, and it follows that different methods of analysis are called for.

In the manual arts field have we anything to analyze of the same type as that which vocational education has to offer?

Let it be considered that for the term "trade" we have the term "course," and for the term "job" we have the term "lesson." The trade is a course. But the course is not a trade. The job is a lesson. But a lesson is not a job. Do we plan the manual arts course, then, by analysis of a trade that is akin to our course?

I am endeavoring to give an idea of laying out an elementary manual arts course, not by analysis, but rather on the basis of finding lessons and building upon them.

Lessons contain something that has to be "put over." Eliminating all assumption as to what the boys know, the lessons are planned to take cognizance of every little piece of instructional information. I determine and number the lessons:

1. By the proper methods of procedure—to get their number.

2. By their learning difficulty—to get order for numbering.

3. By analysis of projects—to arrive at content.

Lessons are listed, and numbered in the following manner:

Lesson		Lesson	
1	Drawing	17	Painting
2	Standards and Conventions	18	Varnishing
3	Bill of Material	19	Enamelling
4	Specifications	20	Stenciling
5	Cutting our Material	21	Patterns
6	Squaring Material	22	Fastenings
7	Sizing	23	Gluing
8	Chamfering	24	Dowel Joint
9	Beveling	25	Butt Joint
10	Rounding edges	26	Dado Joint
11	Tapering	27	Rabbet Joint
12	Boring	28	Cross lap Joint
13	Sandpapering	29	End lap Joint
14	Staining	30	Blind Mortise Joint
15	Shellacing	31	Miter Joint
16	Waxing	32-38	Geometric Constructions, etc.

These lessons are written out on index cards 3"x5" for reference purposes only, one side used for instruction, the other for examples or drawings illustrating the lesson. (See sheet 2A for example.)

Care should be taken when writing out these lessons, so that the pupils may read and understand. An effort should be made to meet his intelligence. Owing to lack of space on the cards, the lessons should be expanded on the copy for the pupil's use.

These lessons are now mimeographed (say 25 copies for each lesson) on one side of good strong paper 8½"x11" in size, or thereabout.

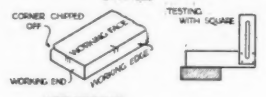
Instructions are paragraphed, followed by knowledge of terms, examples illustrating the lesson, questions, and a place for references. (See example sheet 2b.)

FRONT

No. 6	SQUARING MATERIAL
INSTRUCTION	KNOWLEDGE OF TERMS, ETC.
Select best side for face.	Squaring in three steps
Plane straight from end to end. Test with plane length ways, and with square from edge to edge mark I.	1st Working Face I 2nd Working Edge II 3rd Working End III
1st Step. Plane edge straight and square from face mark II.	Winding Sticks Direction of Grain
2nd Step. Plane end square from working face and edge.	Plane and Square Test
Chip corner off a little on end way from working edge to prevent splitting mark III.	
3rd Step.	

BACK

EXAMPLES



QUESTIONS

1. How did you find out your planed surface was straight?
2. What position must your plane be in while in use?
3. What happens when you plane end wood? How do you avoid it? Where?
4. How many shavings do you take off to square up your working face? Why is it called working face?

REFERENCE:

SHEET IA.

These mimeographed copies of lessons are for the use of the boy, and, therefore, should be put in a file in an accessible place, with their numbers and titles plainly visible.

I am now prepared to meet my class on the first shop day in the term. After the preliminaries are over, which are typical of a first day appearance, the selection of projects is next in order. Let the boy select his own project aided by reference to books or magazines, blue prints in possession, or finished projects in the shop, and let the boy have his own project, because it is a factor of consequence in interest. In turn, when selection is completed, the boy reports at the desk, and makes known his proposed work. The project is discussed with the boy and carefully considered from the standpoint of educational and practical utility, difficulty, cost, etc. If approved, the project is then analyzed to determine the number and

LESSON GUIDE

Name John D. Smith Grade 6A Bench No. 5 Project Ring Toss

Read your project specification first.
Your Job contains the following lessons. You are expected to apply yourself diligently to the lessons herein contained.

Nos. 1 3 4 5 6 7 12 14 13.

Report to Instructor: Ready for next lesson after No. 13 bring specifications with you

Total points on Lesson questions answered:_____

" " " Project questions answered:_____

" " " Workmanship:_____

" hours to complete project: hrs.; Total points:

SHEET 2C.

This is a beginners' class. Four projects suggested: Game Board, Ring Toss, Coat and Hat Rack, and Ring-a-Marble, all of which contain somewhat the same lessons. His proposed work is the making of a Ring Toss.

Lesson No. 6—Squaring Material

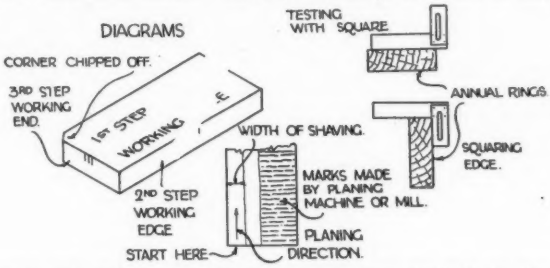
Instruction

You have your material cut out, and on your bench. You have learned how many sizes it has. How does it look; is it smooth? Is it square? Are all the sizes the same as those shown on your drawing? Would you measure from a rough side? What would be the result if you measured from a rough side, then smoothed and straightened that side off?

Your next job is to square your material, that is, smooth and straighten out three sides so that you can measure your three sizes from them. You do it in three steps. Take time and do each step correctly. Your bad or good work will be seen. The better you do it, the more pleasure you will have looking at it when your job is finished, when it is polished or painted.

Step No. 1

Select the best side; fix your material in the vise as you have been shown. Take your jack plane, start at the



near end and at the left edge and plane straight to the other end. Keep your plane parallel to your work. Take off two shavings, working with the width of the shavings toward the other edge. Study the pressures of both right and left hand when planing. Test for straightness lengthwise with corner of plane. Place plane on bench on its side. Why do you put it on its side? Test with square for straightness from edge to edge with the work in your hand, holding it up toward the window for light. When straight, write your working face mark on it. See diagram at the end of the lesson.

Step No. 2

Place your work in the vise edge up. Plane straight, and square from working face. Write your working edge mark II when finished. See diagram at the end of lesson.

Step No. 3

Fix work in vise end up with working edge next to you. Chip off corner a little with plane or chisel at edge that has not been planed working from edge to end direction. The reason you do this is to prevent it from splitting. Plane square from working edge and working face. When finished write on your working end mark III. See diagram at end of lesson. You have now squared three sides getting them into shape so that you can measure from them.

Terms or names you have learned and will remember

Squaring in 3 steps, 1st Working Face 1, 2nd Working Edge II, 3rd Working End III, Plane and Square Test for straightness. How much do you know about "Winding Sticks" and the direction of the grain?

Questions you answer on a separate piece of paper

1 How did you find out your planed surface was straight?

2. What position must your plane be in while in use?

3. What happens when you plane end wood? How do you avoid it? Where?

4. How many shavings do you take off to square up your working face? Why is it called working face, edge and end?

2B—Expanded Lesson Sheet for Boys' Use

name of the lessons contained therein. The same are written out on a slip of paper, called lesson guide, and attached to a sheet of drawing paper, given to the boy who is led to understand that one lesson at a time is to be taken out of the file, replaced at the end of the periods, and reporting at completion of each lesson (see sheet 2C).

The lessons are written in such a way that the boy is enabled to go through his work to the development of

2D—Project Specifications

Project

Good sport and pleasure may be had in the playing of the game, the object being to throw four rings made out of rope onto the base encircling the peg, or onto the peg if hung on the wall. Each player tosses four rings at a time, the score being counted with the number of rings successfully tossed onto the peg. The game is twenty-five or fifty points. This practice of tossing the ring gives you a good test for the eye in judging distances. On board the ocean liners the passengers play this game, and they get a good deal of pleasure out of it in competition with others.

In the making of the Ring Toss you will learn to square and size your material, to plane a chamfer, and to fit a peg. If you bore the hole to receive the peg first before you chamfer, it will make it easier for you to find the center. If you are using a square peg, shape the end round with a chisel the size of the thickness of the base, from the end of the peg. Cut the peg square in with the Back Saw where the round shape stops so that it will be a close joint when in position. When you have it nicely sandpapered, no marks to be seen, put a little glue on the sides of the hole all around with a small pointed piece of wood. Put peg in position, drive it down with the mallet. Wipe any glue off from that face that will show with a wet rag. The glue will be getting hard, and your Joint strong while you clean down your bench and get ready to stain or paint as you have decided to do. After staining or first-coating of paint, make your rope ring while your work is drying. When dry apply a coat of shellac or a second coat of paint, then continue on the ring making.

Answer the following questions

1. Do you bore before chamfering? Why?
2. How do you apply the glue? Where?
3. When do you put the peg in position?

SHEET 2D.

the project by himself. The lessons, which are to be demonstrated, are so marked in the index cards. Experience makes us familiar with them, and there is no need for a reference.

We have given the boy experience—how it is done. It is "up to him" to think out the doing of it. Strayer has said "the great work of teachers, to render our services unnecessary."

Projects being a unit of instruction, it will be found necessary to develop a specification patent to each project, enumerating reasons for the job, and procedure in construction. Questions are stated, for a test to be answered when finished or during intervals in the processes of finishing. (See sheet 2D).

Records of days absent, lessons and projects completed, and grades, are filed in a separate index. Indexed by grades or classes the same as you would have on a class roll. Cards 3"x5" are printed as shown in the diagram, both sides being used. (See sheet 3A).

3A ABSENTEE REPORTS

FRONT

Surname	Name	Bench No.	Grade	
Smith	John	5	6A	

	REPORTS	Date
SEPT.		
OCT.		
NOV.		
DEC.		
JAN.		
FEB.		
MARCH		
APRIL		
MAY		
JUNE		

BACK

	PROJECTS COMPLETED	Hours
SEPT.		
OCT.		
NOV.		
DEC.		
JAN.		
FEB.		
MARCH		
APRIL		
MAY		
JUNE		
	LESSONS COMPLETED	No.

SHEET 3A. FRONT AND BACK.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

THE BARE TRUTH

One of the significant statements of Arthur W. Dow in his discussion of composition is "The bare truth may be a deadly commonplace." Mr. Dow, in his reserved but forceful way, was persistently warning his pupils against the commonplace. "Mere accuracy has no art value," writes Mr. Dow in his discussion of composition in representation.

Such insistence on the need of original thought and expression in our study and teaching of Art is a protest against the customary methods.

Liberal Education is concerned with the development of the individual as an individual and though much information must be imparted by the teacher and the "bare truth" learned by the student, if the process of education ends with information there may be little of educational value and no art value as a result.

The teacher of the Industrial Arts who confines his instruction to information of industrial interests and practice in remaking models already designed is never more than a trade teacher and under school conditions is usually a poor teacher of trades.

Every school project that is worth while must have some element of originality for the pupil.

The deadly commonplace of our American homes, towns and schools will not improve until the desire to create original effect is cultivated in our schools. Standards of originality must be established. Our arts of design have become so plagiarized that few recognize originality as of merit over a fair copy.

Our school exhibitions are collections of indifferent copies of designs published and printed and placed in the hands of pupils to imitate. Our teachers are most responsible in this plagiarism.

The continual cribbing of decorative schemes, pictures, designs and even the appropriation of entire schemes of design in school work has given us a perverted sense of art in relation to education.

Is it not possible to send each young person from the schools with that critical attitude of mind toward composition which impels them to realize and appreciate well related and beautiful effect?

Is it not possible to give each young person a glimpse into the world of Art which will give them the realization that Art is not a replica of exact measurements or a particular order of form but a reflection of personal and individual conception that is beautiful and valuable beyond price?

DO YOU REMEMBER WHEN?

There is no more effective way to realize the present than by recalling the past.

Do you remember when the artist of the class in Spencerian writing drew impossible, fantastic birds and deer with attenuated tails and legs? Do you recall the pride some gifted penman exposed in the map of our country bordered by waving lines that carried far out into the sea? Do you recall Pharoah's Horses rendered by the school prodigy in such realism that the livery man actually paid a dollar for it and hung it in his office? The Stag at Bay and a basket full of kittens; a yard of pansies and a yard of red roses; gave the judges at the county fair no little difficulty in awarding the prizes and gave the fortunate artist assurance of a great career.

Do you remember when our drawing books had a pretty picture on one page and a convenient blank page opposite on which we copied the pretty picture with more or less success? Of course we boys were not strong for that sort of thing and our copy often bore thumb prints that made our signature quite unnecessary, but how some of the girls did compete for honors. The boys were handier with tools in the basement woodshop and after the routine of joints had been made to suit the boss, we were allowed to turn a napkin ring on the lathe or make a chip carved jewel box. Do you remember how we glued mahogany, walnut, maple and other woods together in alternate strips of dark and light like a barber's pole and turned fantastic gew gaws on the lathe? The poor little rich boy of the school even had a foot-power scroll-saw of his own at home and made inlaid pretties out of cigar boxes.

Then comes the mechanical age. The poor little rich boy got a bicycle for Christmas. It was as tall as he was and the most acrobatic of us learned to ride the thing after a few headers over the big front wheel.

The village blacksmith made one that summer. It weighed near to a hundred pounds and he rode it to a fall that laid him up for a month.

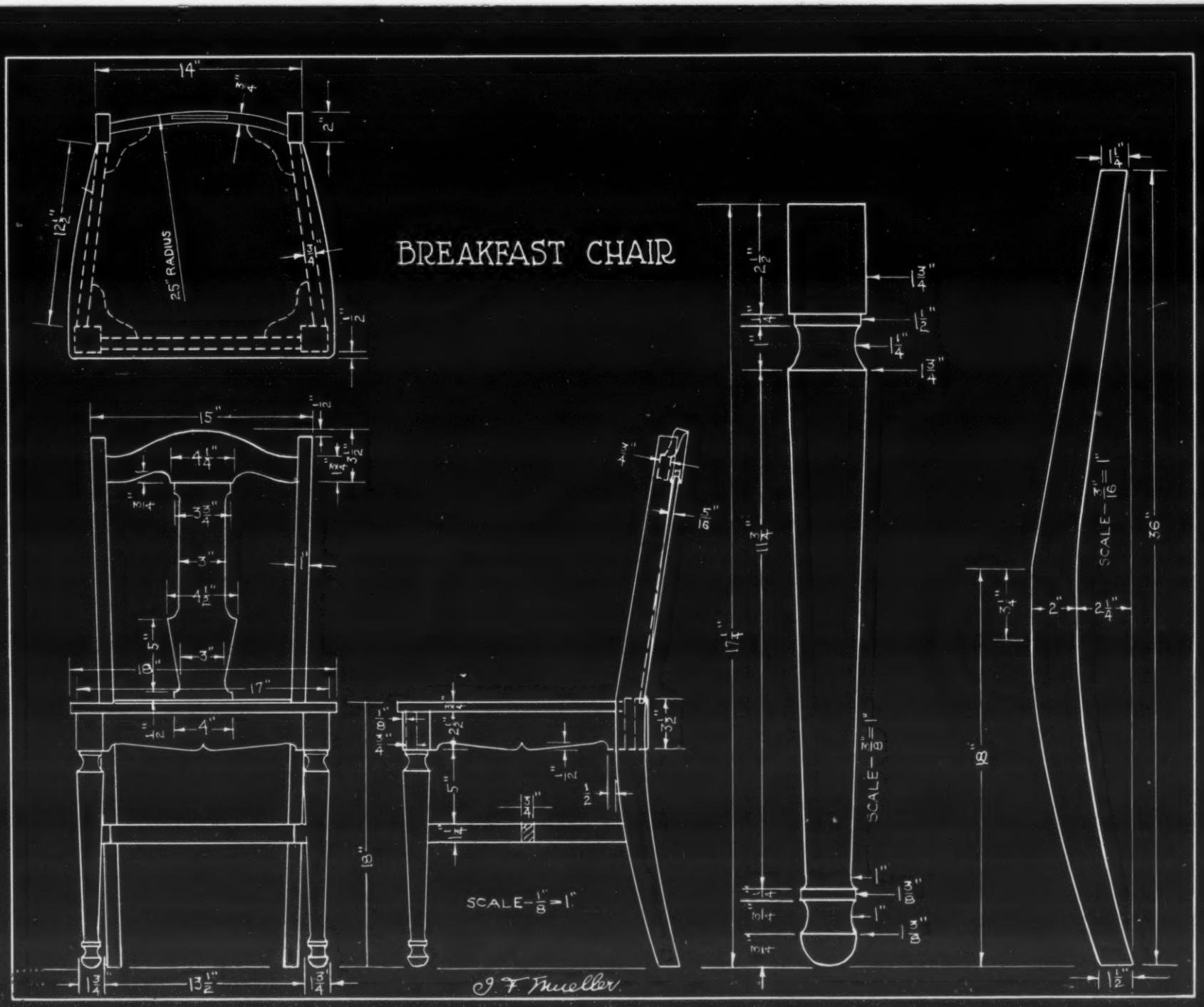
The little rich boy's father got a safety the next Spring and then the whole town went bicycle crazy.

Do you remember teaching a very particular young lady how to ride a bicycle? Perhaps it was the first teaching job you had and started you on a pedagogical career. Perhaps it also is the origin of your interest in mechanics and your firm belief in co-education.

Whether you remember any or none of these particular things they may be verified by talking with the old folks.

The historians of our Industrial Arts do not always expose the exact chronology of the subject.

There was a time when in the minds of our fathers the highest accomplishment of art was the drawing of Guido Reni's Christ head with one stroke of the pen beginning at the tip of the nose and going round and round with a continuous stroke of varying weight recording the form of grief stricken features crowned with thorns.


BREAKFAST CHAIR
14"
2"
12½"
25" RADIUS
¾"
1½"
15"
4¼"
3½"
3¾"
3"
1"
4½"
5"
18"
17"
4"
13½"
¾"
SCALE-⅛"=1"
SCALE-1"=1"
SCALE-1"=1"
2½"
1¾"
1½"
1¼"
17¼"
1"
⅜"
⅝"
1¼"
2¼"
36"
J. F. Mueller

Bill of Materials for Breakfast Chair.

1—1⅛″ x 8″ x 37″—For Two Rear Legs.
1—2″ x 2″ x 36″—For Two Front Legs.
1— ¾″ x 3″ x 16″—For One Front Rail.
1— ¾″ x 6″ x 14″—For Two Side Rails.
1—2″ x 4″ x 30″—For Two Rear Cross Members.
1— ¼″ x 5″ x 18″—For Rear Panel Strip.
3— ¾″ x 1½″ x 16″—For Three Lower Braces.
1—2″ x 4″ x 12″—For Braces.
1— ¾″ x 10″ x 36″—For Seat.

Supplement to the Industrial-Arts Magazine, March, 1925.
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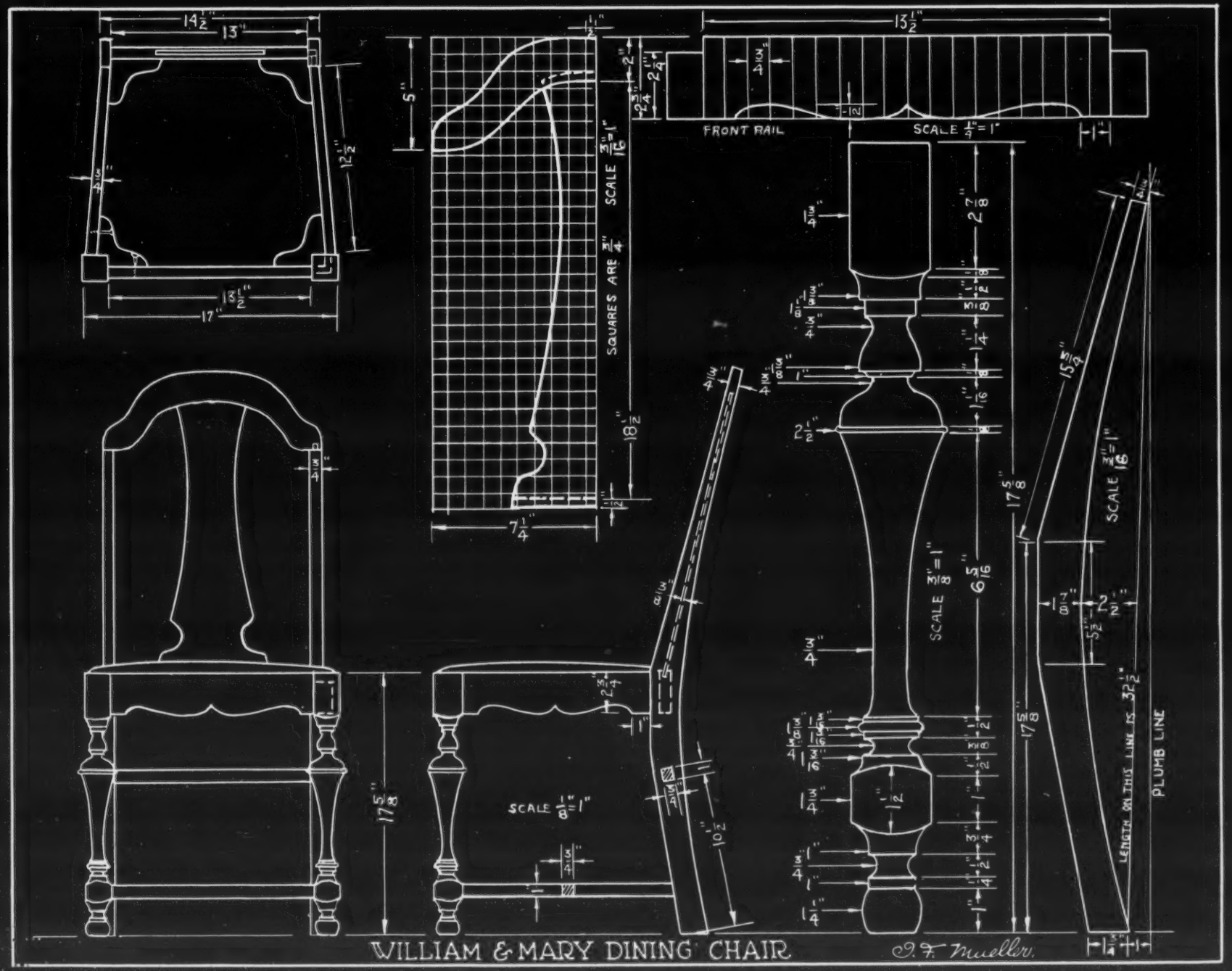
WILLIAM & MARY DINING CHAIR
J. F. Mueller.
FRONT RAIL
SCALE 1/4" = 1"
SCALE 3 1/16" = 1"
SQUARES ARE 3/4"
SCALE 3 1/8" = 1"
SCALE 1/8" = 1"
SCALE 3/32" = 1"
PLUMB LINE
LENGTH ON THIS LINE IS 32 1/2"

Bill of Materials for William and Mary Chair.

1—	¾" x 8"	x 33"—For Two Rear Legs.
2—	2" x 2"	x 18"—For Two Front Legs.
1—	¾" x 3"	x 48"—For Gluing on extra material for large bells on front legs.
1—	¾" x 3"	x 16"—For Front Rail.
1—	¾" x 3"	x 30"—For Side Rails.
1—	¾" x 3"	x 15"—For Rear Rail.
1—	¾" x 6"	x 15"—For Head Piece.
1—	⅜" x 6"	x 20"—For Rear Panel Strip.
4—	¾" x 1¼"	x 15"—For Lower Cross Pieces.
1—	2" x 4"	x 12"—For Braces.

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There was a time when Manual Training consisted of making various knick-knacks of wood with the idea of developing skill of hand.

Now these operations have multiplied to include a variety of mediums, materials and educational purposes.

The thoughtless teacher goes about looking for new stunts and projects which may be added to the variety but with little conception of what it is all about. The thoughtful teacher adds to the variety of work attempted only when convinced that the project involves a desirable and necessary educational interest.

The distinctive educational interest of the Industrial Arts is the development of appreciation and judgment of well applied design. No one can become expert in many applied arts. A few may become expert in one but hardly that under school instruction alone.

All students can learn to recognize a variety of consistently planned and well executed things in school if they are taught a few underlying principles such as balance and harmony by a teacher of ability. While the doing of a fine job and the making of a choice object may be the incentive of the pupil it is not the whole purpose of the teacher. The teacher must see to it that the pupil develops appreciation and judgment. This may be done by making only a few of the many things that are now attempted under the Industrial Arts.

No program can keep pace with the increasing variety of occupations.

No teacher can afford to attempt many kinds of work.

THE LIFT OF INHALATION

There is a theory that fine art is dependent for vitality on a certain expression of respiration. A lift of the chest as it were, which is essential to the expression of energy and life.

We are inclined to question the invariable chestiness of works of art or of artists but we have experienced a decided intake of breath and a definite inspiration from works of art.

Moreover the coming Spring is the season for tonics.

Spring is also the season of large sectional meetings of teachers of the Industrial Arts. We all need this lift of inhalation, this tonic and inspiration that comes with meeting many workers in the Industrial Arts.

When we attend teachers' conventions the program often seems of least importance. We gather valuable hints from the exhibits.

We talk shop with the fellows and get samples of a lot of commercial products. We see a little of the schools and industries of the community. We have a good time but with a subconscious impression that the work is piling up at home. We are a bit uneasy with the feeling that the year's crop is not yet in the barn.

Have you ever been the victim of discipline that added insult to injury with the assurance that the executor suffered more than you? Have you ever told your class that they will get out of school just what they put in? The logical reply of the boy who is told that a whipping hurts his father more than it can hurt him is "Father forbid; I cannot see you suffer for my sins." The logical next question of the boy who is told that he will get out of school just what he puts in is, "What are teachers for?"

Convention programs are wasted by the indifference of teachers who are registered with the secretary but do not attend or take interest in the general meetings. The last meeting of the program of the Western Arts Association at Dayton was so good that local people turned out and with a few of the faithful members made a fair audience. The address was one that every teacher of Industry and Art should hear. So has it been with teachers' conventions from the beginning. The general program is made up of addresses by people who are often inspiring speakers with a distinct message and the ability to put that message over to the particular people who need it, yet the members for whom it was planned are conspicuously absent.

No organization of teachers can discipline its members.

The organization suffers by indifferent members and is sustained by a few faithful and persistent workers.

The faithful member gets much more than he puts in. He gets inspiration for better work and a reminder that the teacher must be inspirational as well as instructive.

The lift of inhalation has been known to lift otherwise ordinary plodders out of ruts and into high places.

PECK AWAY

"A woodpecker pecks
Out a great many specks
Of sawdust while making his hut;
He works like a nigger
To make that hole bigger
He's sore if his cutter don't cut.

He uses no plans
Of cheap artisans
But there's one thing can rightly be said,
The whole excavation
Has this explanation:
He makes it by using his head."

A right-minded boy
Will find it a joy
To work with his body and mind
If but one he uses
The boss soon refuses
An increase on payday to find!

Make use of your head—
Don't let it be said
Of you that you can't hold your own
You'd better "go to it"
Or later you'll rue it;
Fill your head full of brain—not of bone.

If You are right minded
You'll certainly find it
Worth while to develop your brains,
For if them you keep bright
You'll ere long have a right
In business to handle the reins.

—C. Neville Walker.

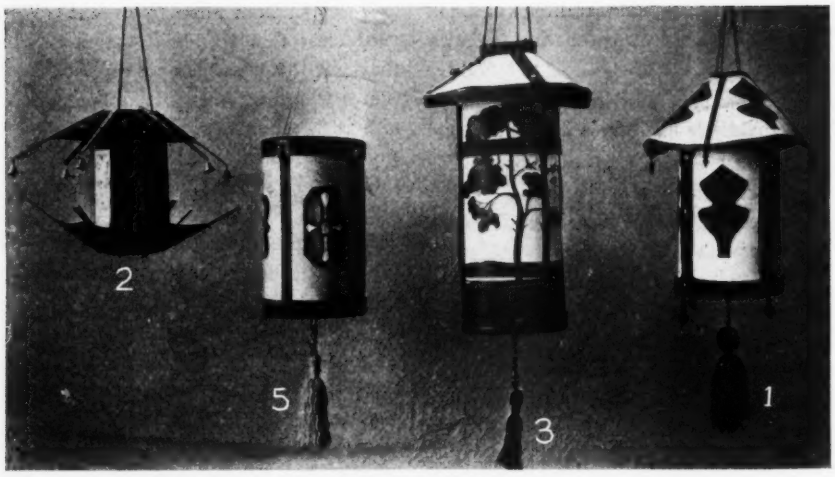


FIGURE 1.

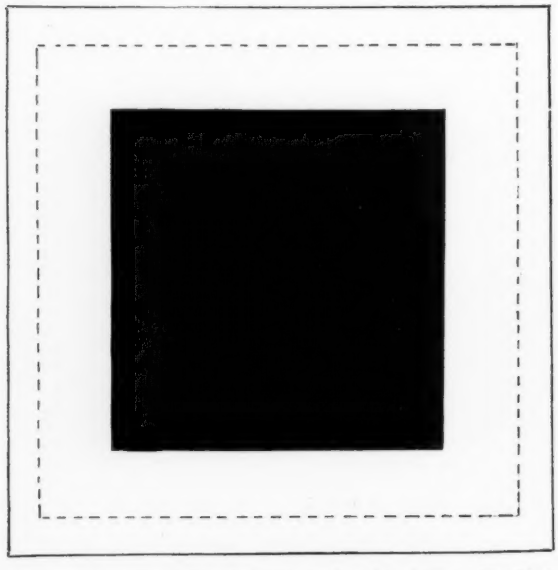
Lanterns That Make the Home Inviting

Richard Ernesti, Director Art Education, Colorado Springs, Colorado

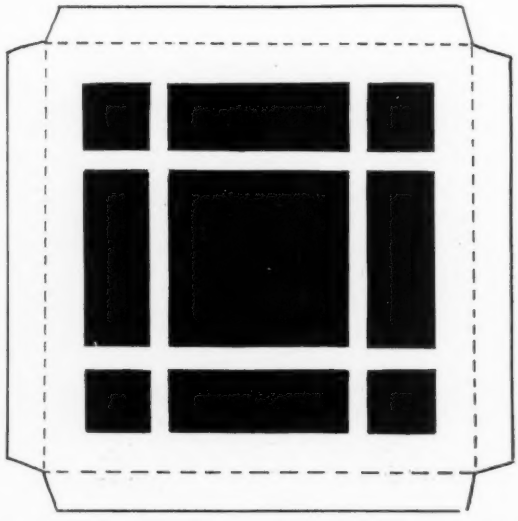
In my home there are many lanterns, many varied lights. We vie with each other (we are all art teachers) to see who can produce the most charming light effects, to make an atmosphere at all times cozy, agreeable, inviting to our friends and callers. And all these varied light effects, through lanterns, are the result of research in an effort to give our youngsters whom we teach in the grades, junior high and high schools something of interest, something to whet their appetites toward creation, something, anything to make *home,* to make the *world* the *life* more *beautiful.*

The illustrations in this article show various efforts. No. 1 is a class piece done in the Garfield school by a fifth grade, as a Christmas gift to the director of art. Of this style the schools produced something like two thousand last Christmas season, each one, of course, ornamented differently as the individual chose. The work was done in all the upper grades and while, no doubt, many have perished ere this, being only paper work on a base of oatmeal containers, still they have carried the message to Garcia.

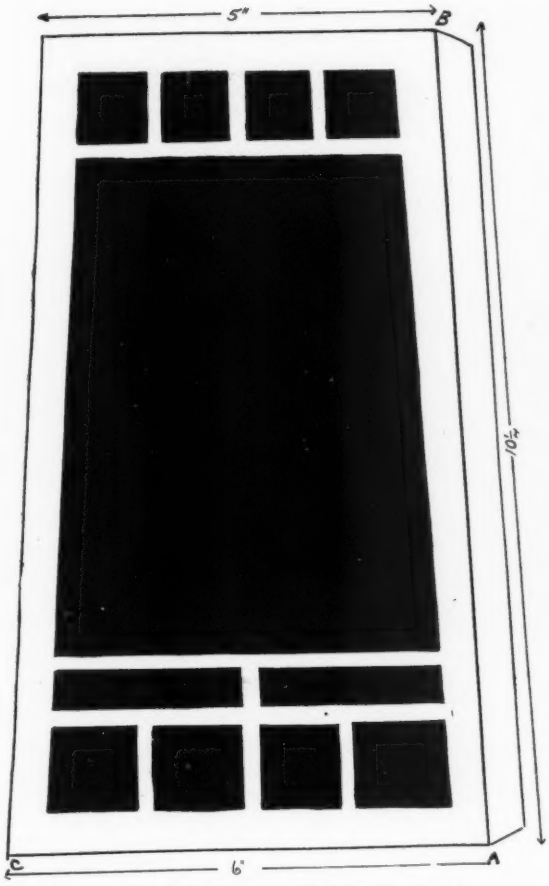
Nos. 2, 3, 4 are individual efforts of ninth graders and speak for themselves. No. 4, which is illustrated in separate drawings in detail, is made from Melton board, black preferable; the size is as given in the drawings and may be varied. It is a good hall lamp, and with care will serve for a number of years. The fasteners used are Rock Barnes round-head brass fasteners. These round-heads adding to the ornamentation considerably, make it possible to take it apart if necessary, and to replace



Top of Lantern—Crown folds rest against dotted lines. The black field measures 5", the dotted square 7", the outside square 8".



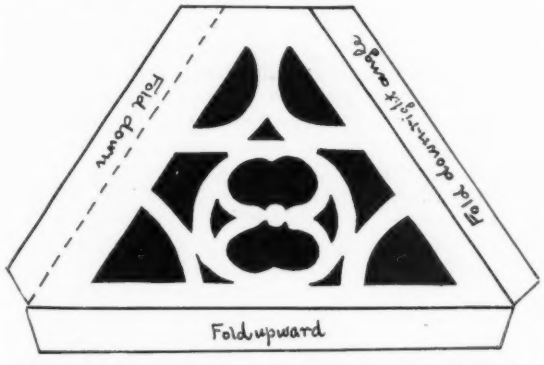
Score dotted lines, bent up to rest within sides at bottom flush with Line C.A. All black fields are cut out and covered on inside with Crepe Paper. The dotted square measures 6".



Cut four sides like this—Score and bend on line A-B.

papers or lamp in the socket. This particular lamp, or lantern. was done in orange and yellow, ranging from top to bottom nicely graded lemon yellow to deep orange crape paper. The metal ring on the top is made from a piece of metal band such as the steam fitters use to hold the asbestos cover on the steam pipes in buildings, and can be obtained from any plumber for nothing. It is bent around a broom handle or any piece of pipe the size of roundness depending on the judgment of the student. A hole is easily punched into the top of the ring to allow the cord of lamp to pass through.

While we make no claim for originality—there is nothing new in the world—the problem is one always inspiring, and the lantern is an article of service in



Make two crowns like this and two crowns with a folding flap at the bottom only. The crowns measure 6¼" at the base.

FIGURE 2.

almost any home. Here is opportunity for ingenuity in variation of form and certainly a chance in the use of color—a great mystery not yet solved.

The day is not far distant, when we will create through color illumination, atmosphere of every possible kind in our homes—cold, warm, or intermediate; cozy, charming, or repellent, as need may require. Daddy may be able to turn on a cold light from his study that will send homeward the undesirable caller at a precise hour. Who shall say *nay?*

Whatever the future holds in store for us in color discoveries, the constructive value of these lantern problems is ever new, and full of interest to children.

THE RUBBERIZED SCHOOLHOUSE

Laurence Parker, Kansas State Teachers' College, Pittsburg

We all are agreed that a rubber suit would be most comfortable to wear along about the time we go home to grandfather's to eat Thanksgiving or Christmas dinner. It would make that after dinner feeling such a comfortable one, don't you think?

Well, perhaps, if we could wave a fairy wand and make the walls of our schoolhouses of rubber, it would give comfort to some folks who just now feel very cramped indeed. This sounds very fanciful, but two Kansas communities have done that very thing and as a result of the process some boys are enjoying school for the first time.

The schoolmen in these communities were much troubled because they had large boys "in storage" in the fifth, sixth, and seventh grades. Perhaps, you have some of those good natured, awkward, slow-minded boys in storage in your schools. Perhaps, you are worrying about what is best for them and wishing you could afford to install an expensive "opportunity school" for them. These schoolmen had the same worry and the same inability to provide an elaborate training plan.

Then they hit upon the plan of rubberizing the schoolhouse walls so that it would take "all the cramp" out of the training of these boys.

This rubberization process is so simple that it was really a hard thing to think of in the first place and to realize in the second place that it would work.

The schoolman just called these big boys, one by one, into his office and got acquainted with them. Just found out what were their secret longings, their desires, and their ambitions. I expect that all took time and could only be done when the schoolman felt especially like a big brother to the big boy and had plenty of time. He never could have found out what he wanted by getting a vocational guidance questionnaire filled out by the boy. Just imagine filling out such a form yourself, and telling me about what you hope to do and to be.

Anyhow the big boy in each case showed a great interest in some line of work. One, perhaps, wanted to be a grocery clerk, another a radio manufacturer, another a plumber, another a shoe repairer, another a tire and battery repairman. After those interviews, no doubt, the schoolman wished for an opportunity school more than ever. His manual training department could not train these boys along the line of their interests.

Then, he rubberized the walls of the old schoolhouse in the easiest possible way. He just closed his roll-top desk and spent a few hours with the business men of the community. One by one he got men interested in half-day training of a big boy in his trade right there in his shop. All he asked was that the business man think of the big boy as a son or neighbor boy and give him a square deal, call the schoolman on the phone if he should fail to show up, and suggest to the manual training teacher any shop work, drawing or mathematics that would help the big boy to make a better workman.

And so, one by one, the big boys who really were interested in a trade and who were in storage, began dividing their day's work between the training shop of industry and the manual training shop of the schoolhouse. The plan works best where the business man runs a small establishment and can personally instruct the big boy.

And in this way, quietly, without elaborate surveys, questionnaires, or any publicity, the walls of that schoolhouse have been stretched to include several business establishments of the community and those big boys are now out of storage and in training for their life's work.

Design and Industrial-Arts Work

Richard E. McKenney, Jackson, Minn.

The disciplinary value which always accompanies accuracy in the manual training shop is one of the "carry-over" traits usually sought by the instructor. This article makes no attempt to minimize the importance of developing painstaking accuracy on the part of the student. However, if regarded as an end in itself, precision, with no thought for projecting the individuality of the student into his work, can result only in the abandonment of such work by the average boy. This article is concerned with how to secure personal interest, creative ideas and initiative, in addition to the well-established idea of accuracy.

Contrary to general opinion the average pupil can develop an appreciation and capacity for original design if opportunity is offered. Mr. Dean M. Schweikhard, state supervisor of trade and industrial education of Minnesota, has been working hard to develop the idea of general industrial intelligence. When this idea becomes firmly rooted in the minds of school authorities and patrons, the pupil's appreciation and respect for the trades will take on new color and meaning. There will be fewer attempts at turning out skilled carpenters in two years of high school work. Industrial intelligence, original design, spontaneous interest, initiative and accuracy will be included in the new interpretation.

In the accompanying photograph, showing the work of the Jackson, Minnesota, high school students, wood turning, cabinet work projects, plaster moulds, plaster plaques, reed work, cement work, gesso work, and pottery are represented. Most of the work shown was done by students who had never attempted anything in the way of design.

The year's work was begun with a careful discussion of the elementary principles of design. Such procedure is almost imperative if the instructor is aiming at any real results. The students collected samples of both poor and good design to show the application of the principles discussed. In the Jackson schools these samples consisted chiefly of photographs of furniture, pottery, cement work, leather work, posters, foundry, etc. A poorly designed vase, a hideous piece of old mission furniture in the form of a footstool, several poorly designed candle-sticks, and even a grotesque and inefficient bird house were exhibited. The amount of interest developed by such lessons was of sufficient inspiration and encouragement to justify recommendation to any instructor.

The time taken for development of good design principles, discussion of good and bad merits of exhibits and sketches required about two weeks at the beginning of the first semester. This period also included discussions as to what forms of furniture, pottery, metal working, etc., would lend themselves particularly well to good design. Among the numerous things decided upon were book ends, medicine cabinet, flower box, serving tray, writing set, candle-sticks, lamp base, toys, bird houses, pottery, cement book ends, tiles, plaques, etc. During the third week, projects were selected, based mainly upon the student's interest. That which appealed to him as especially suited to both accurate measure and good design, was chosen. This period also included a careful plan of faces, or parts, to be designed and sectioned into one-fourth or one-half inch squares. This proved quite a task in accuracy for the budding designer, but with a good drawing board, a T square, and a triangle the problem was solved with a fairly good degree of accuracy. The next step in the third week period may be divided into four stages: First, an original sketch was drawn in sketch by the student; second, criticism and suggestions were made by the instructor; third, the original sketch was carefully redrawn; and fourth, a cut-out of pattern and tracing to be used on parts was selected for enrichment.

With these principles in mind the pupil discovers that he, too, has some originality within him. Hence, he puts forth his best creative effort. No amount of labor seems too great for him to spend in obtaining a surface suitable for the design.

The instructor must exhibit much patience with the budding designer until he or she can get the proper muscular control. This capacity is latent and presents itself, in most cases, to a far greater extent than is generally supposed. Contrary to traditional opinion artists are not "just born." Encouragement with the proper educative steps will often draw out this capacity in what seems to be the clumsiest boy. In many cases designs must be redrawn several times before being finally ac-

SOME OF THE PRODUCTS OF THE AUTHOR'S CLASSES.

cepted. These cases tax the patience of the instructor, but are surprising and favorable in results.

In the Jackson schools the idea of design was first introduced in connection with wood working. In the years 1923-1924 and 1924-1925 it has extended to the use of cement, clay, plaster, reed, gesso, and wood turning. Plans are being considered for the addition of metal work next year. In this way it is hoped to develop what the state department has properly styled industrial intelligence, as well as the industrial appreciation of the pupils.

Bookbinding, Repair, and Rebinding

Chat. A. Picken, Detroit

(Continued from February)

Exercise 6—Loose Pages

(a) "Tipping in." (See General Directions, Exercise 6, a.)

Equipment: Paper trimmer or shears, paste brush, bonefolder and weight.

Supplies: Plain paper, paste, newspaper.

Method of Procedure:

Cover desk with newspapers.

1. Repair leaves.
2. Strengthen sewed margin if necessary. (See General Directions, Ex. 6-b.)
3. Test leaf in book to see that it fits.
4. Apply paste to one-eighth inch of sewed margin.
5. Insert leaf in book.
6. Iron down inner margin.
7. Close book to dry.
8. If leaf extends beyond the margin of other leaves, trim when dry.

(b) Pages with a Hinge (See General Directions, Ex. 6-d).

Equipment: Paper trimmer or shears, paste brush, bonefolder, steel ruler, weight and waxed paper.

Supplies: Plain paper, paste.

Method of Procedure:

1. Repair leaf.
2. Paste hinge to inner margin.
3. Test leaf in book.
4. Apply paste to hinge.
5. Insert leaf in book.
6. Iron hinge down with the fold of book.
7. Insert waxed paper in the hinge.
8. Close book to dry.

Exercise 7—Repairing Corners of Covers

(See General Directions, Ex. 7-d)

(a) Vellum Corners.

Equipment: Shears, ruler, pencil, paste, brush, bonefolder and weight.

Supplies: Gummed vellum, 3" wide, newspapers to protect desks.

Method of Procedure:

1. Wash covers.
2. Cut vellum for corners.
3. Paste vellum on corners and iron well.
4. "Turn in" on edges and iron well.
5. Repeat in like manner on other corners, if needed.
6. Put under weight to dry.

(b) Pasted Corners (Corners repaired with paste only). (See General Directions, Ex. 7-e.)

Equipment: Shears, paste brush, bonefolder, weight.

Supplies: Paste.

Method of Procedure:

1. Wash covers.
2. Apply paste between folds of chipboard.
3. Iron down well.
4. Trim off any frayed places.
5. Rub any worn places over with paste to make a smooth surface on edge.
6. Put under weight to dry.
7. Shellac covers when paste is dry.

Exercise 8—Repairing Backs of Covers

(See General Directions, Ex. 7-a)

(a) Repairing back without removing covers.

Equipment: Shears, pan, sponge, bonefolder, copper wires and weight.

Supplies: Gummed vellum 3" wide.

Method of Procedure:

1. Cut vellum the exact length of book.
2. Paste vellum on back of book.
3. Iron down well.
4. Rub down the joints.
5. Set joints with coppered wires and put under weight to dry.

6. Stack. (See General Directions.)

(b) Repairing Back with covers removed.

Equipment: Shears, pan, sponge, bonefolder, coppered wires, waxed paper, auburn board and weight.

Supplies: Gummed vellum, 3" wide.

Method of Procedure:

1. Cut vellum about one inch longer than back of book.
2. Lay vellum on desk, the gummed side up.
3. Dampen vellum.
4. Replace book in covers.
5. Set back of book down in venter of the vellum.
6. Iron strips of vellum down on covers. Do this with the palm of the hand, so you will "iron" the back at the same time.
7. Remove book from covers.
8. Remove any super or loose paper on inside of cover.
9. Paste down any loose vellum.
10. Paste the one-half inch extending strips down on inside of covers.
11. Iron well.
12. Replace book in covers with double stripping. (See General Directions, Ex. 9.)

Exercise 9—Replacing Book in Covers

Covers broken at joint, book otherwise in good condition.

Equipment: Shears, paste brush, bonefolder, coppered wires, auburn boards, weight (bricks).

Supplies: Double stripping (two strips), paste.

Method of Procedure:

1. Remove super and any loose lining from covers.
2. Cut double stripping about one-fourth inch shorter than length of book.
3. Place the book in covers. See that the edges of the book coincide with the edges of the lining paper on the covers.
4. Hold the book firmly in place.
5. Lay top cover back.
6. Apply paste along the back of the book, along the joint, and cut on the first sheet for about one inch.
7. Lay the double stripping down on pasted part so the stitching fits well back into the joint. If the stitching is too far ahead the covers will not open well.
8. Rub down well.
9. Apply paste along the back and out about one inch on the cover of the book.
10. Close cover.
11. Iron well.
12. Rub down joint.
13. Test hinge.
14. Apply paste along the folds of each leaf to the center of the section. These leaves should be tipped together about one-eighth inch.
15. Insert waxed papers between cover and fly leaf.
16. Again rub down joint.
17. Turn book over carefully and repeat in like manner on other cover.
18. Set joints with coppered wires.
19. Place between auburn boards and put under weight to dry.

REINFORCING

Exercise 10—Reinforcing and Replacing Covers

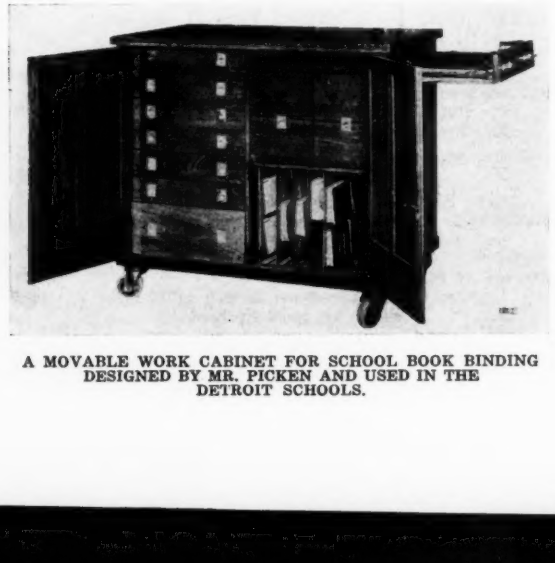
Covers broken at joint, first and last sections loose.

Equipment: Shears, awl, darning needle, paste brush, bonefolder, waxed paper, coppered wires, auburn boards and weight (bricks).

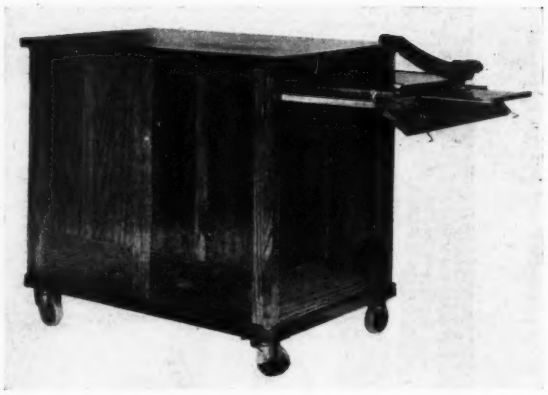
Supplies: Linen thread, double stripping, paste, cotton cloth.

Method of Procedure:

1. Remove super and loose paper from covers.
2. Cut two strips of double stripping one-fourth inch less than length of book.
3. Paste a one-half inch strip of cloth on the first leaf along the inner or sewed margin.
4. Punch holes for overcasting.
5. Overcast sections firmly in place.
6. Replace book in covers with double stripping.
7. Insert waxed papers between covers and fly leaves.
8. Rub down joint.
9. Set joint with coppered wires.
10. Put under weight to dry.
11. Line cover if necessary after joint is dry.



A MOVABLE WORK CABINET FOR SCHOOL BOOK BINDING DESIGNED BY MR. PICKEN AND USED IN THE DETROIT SCHOOLS.



BACK OF A MOVABLE CABINET FOR SCHOOL BOOK BINDING.

Exercise 11—Reinforcing and Repairing Backs of Books

Back needing repair, book loose from cover, and first sections loose.

Equipment: Shears, pan, sponge, bonefolder, coppered wires, darning needle, awl, paste brush, waxed paper, auburn boards, and weight.

Supplies: Linen thread, ½" strip of cotton cloth, double stripping, paste, gummed vellum 3" wide.

Method of Procedure:

1. Paste ½" strip of cloth on first leaf along the inner or sewed margin. Let dry.
2. Punch holes for overcasting.
3. Overcast sections firmly in place.
4. Repair cover. (All covers should be washed before repairing.)
5. Replace cover with double stripping.
6. Insert waxed paper between double stripping, or cord fly leaf.
7. Rub down joint with bonefolder.
8. Set joint with coppered wires.
9. Put under weight to dry.
10. Line cover if necessary after joint is dry.
11. Shellac covers.

Exercise 12—Strengthening Joints

(a) Covers Loose at Joints (See General Directions, Ex. 8-b). (Super loosening from covers, otherwise in good condition.)

Equipment: Marking brush, bonefolder, auburn boards, coppered wires, and weight (bricks).

Supplies: Paste.

Method of Procedure:

1. Apply paste with a long marking brush along the inside of the loose super.
2. Close book and rub joint with bonefolder.
3. Set joint with copper wires.
4. Put under weight to dry.

(b) Covers Loose at Joint—Lining Paper Broken (See General Directions, Ex. 8-a).

Equipment: Pan, sponge, paper trimmer, coppered wires, waxed paper, and weight (brick).

Supplies: Gummed cloth.

Method of Procedure:

1. Trim or pull off any loose paper at the joint.

2. Cut a strip of gummed cloth one inch wide and the exact length of book.
3. Paste a single strip of gummed cloth along joint, so one-half is on the cover, and the other half on first leaf.
4. Iron gummed cloth well back into the joint.
5. Close book.
6. Test hinge (General Directions, Ex. 8, Introduction).
7. Set joint with coppered wires, and put under weight to dry.

Exercise 13—Gluing Backs

When the super and stitching are in good condition, the super should be put back in its proper place.

Equipment: Glue brush, paper trimmer, or shears, copper wires, bonefolder, weight (bricks).

Supplies: Glue, gummed cloth.

Method of Procedure:

1. Trim or tear off any loose papers at joint.
2. Glue back of book along the sewing.
3. Close book.
4. Iron back well.
5. Rub the joints down with a bonefolder.
6. Set joints with coppered wires.
7. Put under weight to dry.
8. Paste single strip of gummed cloth along joint, rubbing cloth well back into the joint.
9. Test hinge.
10. Again put under weight to dry.

Exercise 14—Stabbed Sewing

When threads are loose or broken, old threads should be tightened, new threads added on, and the whole made firm by resewing.

Equipment: Paste brush, darning needles, bonefolder, and weight, waxed papers, coppered wires.

Supplies: Thread, paste, lining paper.

Method of Procedure:

1. Remove super from cover.
2. Remove paper from super.
3. Tighten threads.
4. Tie on new threads.
5. Resew book.
6. Put waxed paper between super and fly leaf.
7. Apply paste to super.
8. Remove waxed paper.
9. Close cover and "iron" well.
10. Test hinge by opening cover.
11. Insert fresh sheet of waxed paper between cover, and first fly leaf.
12. Rub down joints.
13. Set joints with coppered wires.
14. Put under weight to dry.
15. Paste lining on covers.

HAWAII'S STANDARD ONE-ROOM SHOP BUILDING.

Industrial Arts Buildings in Hawaii

F. S. Pugh, Eleele, Kauai, Territory of Hawaii

In Hawaii much progress has been made during recent years toward the goal of efficiency in industrial education. New courses have been added, modern buildings have been erected, and teachers are better prepared to teach the industrial arts. It has been the aim of the administration to economize as much as possible while still keeping Hawaii among the leaders of modern education. It is interesting to note, therefore, that the shops in every case, and many of the kitchens, are now being built to standard plans and specifications. Not only are the buildings standardized, but the equipment also is standardized as far as possible, so that when a new shop is built we know just how much it will cost and the list of repair parts kept in stock is reduced to a minimum. All of our standard tools are such as are advertised in the INDUSTRIAL ARTS MAGAZINE, thereby assuring the instructors that they are getting the best there is.

While the shop is standardized, it may be altered by moving the door location from the end to the middle, or the plan may be reversed, altogether depending upon the location of the shop itself. All shops have toilet and washing facilities, tool rooms with cabinets and shelves, ample locker room, and are well ventilated by the trade wind sweeping across the entire shop through the open shutters or windows. This type of window, or shutter, is especially well adapted to shop buildings in the Tropics, because they keep out rain and sun while permitting the entrance of fresh air. They are hinged at the top and kept open with a piece of wood about 36" long. The ventilator on the roof of the building also assures a cool shop at all times, in fact it is often several degrees cooler in the building than in the shade outdoors.

Double benches equipped with continuous screw vises are provided, and lately a special instructor's bench has been added. In addition, there is a metal working bench, a glue and stain bench, and bench to hold such tools as trimmers, dowel machines, bench drills, and saw vise.

There is no ceiling, and the lumber rack is hung from the ceiling joists although the heavier stuff is kept

STANDARD KITCHEN (LEFT) AND SHOP BUILDING, KAUAI, HAWAII.

underneath the building itself. The floor is of 1¼" edge grain northwest fir and the siding is of 1¼"x6" T. and G. with the rough, unsurfaced side on the outside. The roof itself is of corrugated iron. The building is stained with a green or brown creosote stain and the trim is painted white. The interior is gray up to the windows and white above.

Several of the larger shops are equipped with power machinery run by a gasoline engine. These are both Frisco standards and Novo engines, but we have adopted the latter as standard, simply because it is easier to install and does not require a special water cooling system. We have found the gasoline engine very easy to operate, and it has plenty of power. Students take care of the engines, but in the grades they are not allowed to run either the circular saw or the planer.

In the high school we are adding forge and machine shop equipment to the wood-working shop as well.

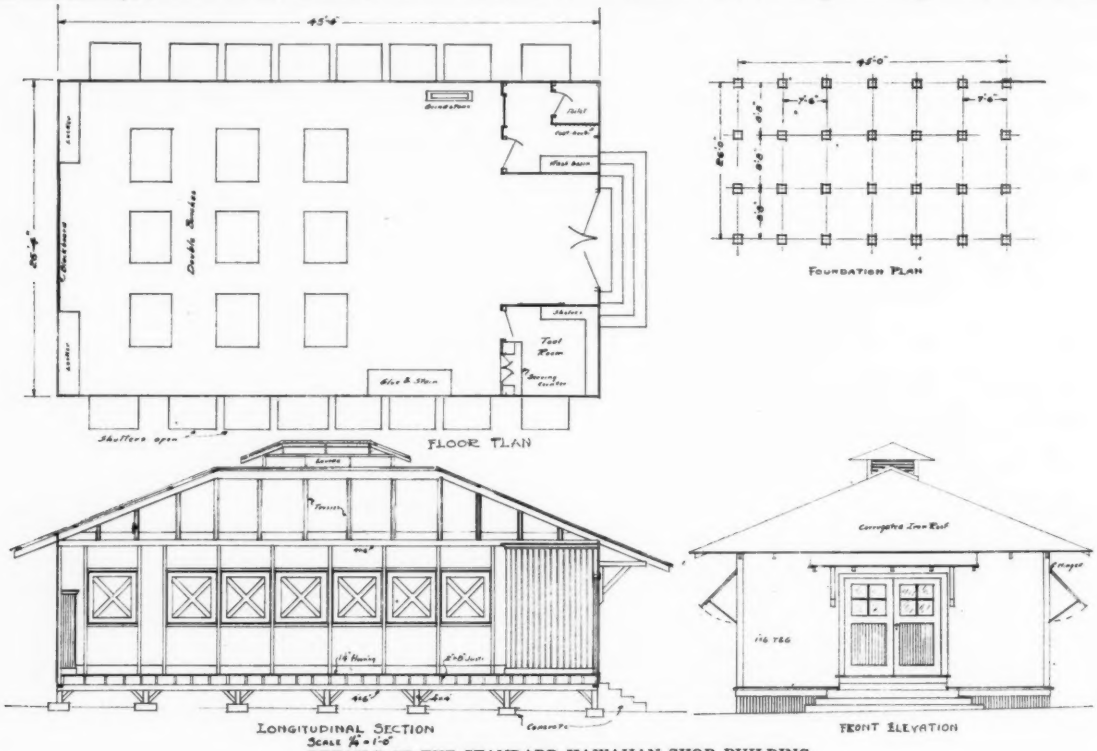
Much has been done toward standardizing the domestic science buildings, but the ideal has not yet been reached, mainly, because no two domestic science instructors can agree on just what is the ideal type. However, each new domestic science building is always a decided improvement upon the last one built. All kitchens include laundry tubs, serving counters, refrigerators, lockers for food and equipment, oil stoves, and hot water supply. Effort has been made to secure a suitable hot-plate for individual work, but all that have been tried have proved too complicated for children's use, and the common high chimney oil stove is now used exclusively.

Sewing rooms are attached to all kitchens and, in addition, some of the recently built domestic science buildings also have open air dining rooms attached, which are especially desirable in Hawaii's superb climate.

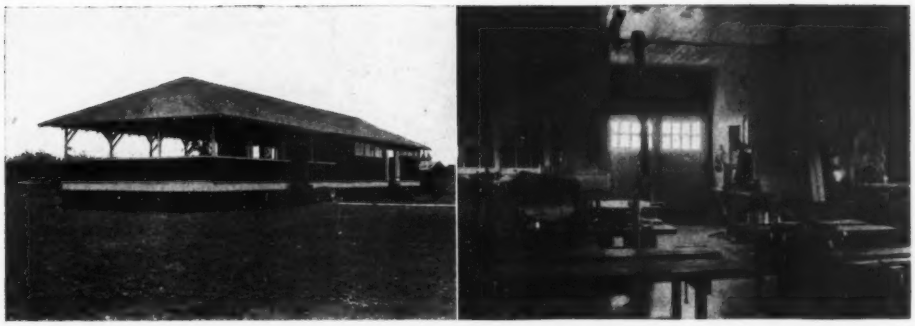
It may be of interest to mainland readers to know that all domestic science instruction is self-supporting, owing to the fact that each kitchen serves for cafeteria purposes as well. From 100 to 500 meals are served daily at an average cost of five cents.

New domestic science buildings will cost about $3,500, and equipment about $600. The shops average $2,500 for the building, and $650 for the equipment. Instructors of both shop and kitchen are paid the same, and may vary from $110 to $150 a month for grade teachers, according to preparation and length of service.

The kitchens are very popular with the public and children alike, and there is never any trouble in getting appropriations for new buildings. The hot noon lunch also benefits the children considerably, and in schools where kitchens are running efficiently there is a notice-



DETAILS OF THE STANDARD HAWAIIAN SHOP BUILDING.



A HAWAIIAN SCHOOL SHOP WITH AN OPEN AIR PORCH FOR WORKING DURING THE HOT SEASON. AT THE RIGHT AN INTERIOR OF STANDARD ONE-ROOM SHOP.

able decrease in retardation, and in the number of undernourished children.

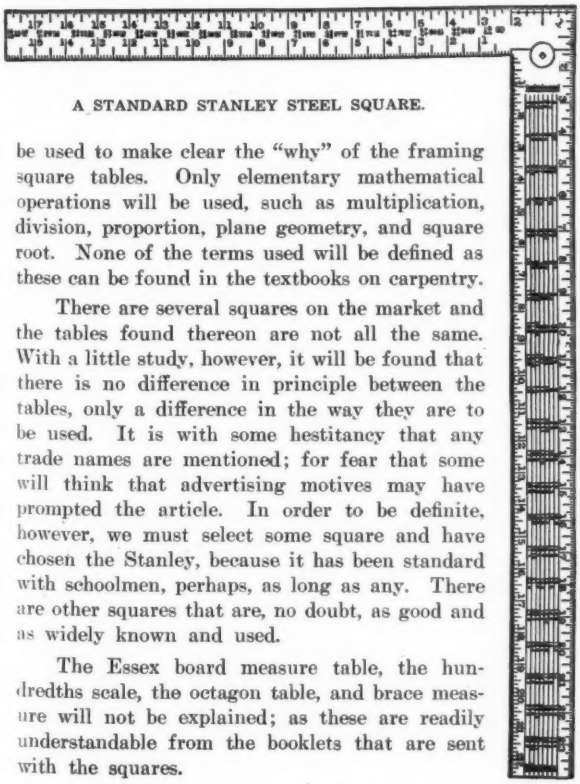
All dish-washing, cooking, serving, and cleaning is done by the children, and outside of Honolulu no janitors are to be found. Shops are swept up by the boys, and academic classrooms are cleaned daily by the students.

At present, the industrial supervisor in each county, or island, supervises work in domestic science, manual training, primary handwork, sewing and agriculture, but in the near future, owing to the rapid development of the industrial arts, it is planned to have special supervisors in each subject. At present the industrial supervisors are paid $290 a month on a twelve-month basis.

The Derivation of the Figures on a Framing Square

William L. Hunter, Manual Arts Dept., State University of Iowa.

Much space has been devoted to the use of a framing square while little, if any, attention has been given to methods of actual development of the tables. Few practical carpenters know how to use all of the figures on a square, and it is safe to say that very few can derive or supply one of the figures should it turn up missing. Schoolmen in the shop should care about the figures on a framing square and should be able to develop them. The method here given is only one of many that might



A STANDARD STANLEY STEEL SQUARE.

be used to make clear the "why" of the framing square tables. Only elementary mathematical operations will be used, such as multiplication, division, proportion, plane geometry, and square root. None of the terms used will be defined as these can be found in the textbooks on carpentry.

There are several squares on the market and the tables found thereon are not all the same. With a little study, however, it will be found that there is no difference in principle between the tables, only a difference in the way they are to be used. It is with some hestitancy that any trade names are mentioned; for fear that some will think that advertising motives may have prompted the article. In order to be definite, however, we must select some square and have chosen the Stanley, because it has been standard with schoolmen, perhaps, as long as any. There are other squares that are, no doubt, as good and as widely known and used.

The Essex board measure table, the hundredths scale, the octagon table, and brace measure will not be explained; as these are readily understandable from the booklets that are sent with the squares.

Holding the body or blade of the square horizontally, and with the tongue in our right hand, six rows of figures appear extending the length of the blade. These figures are further arranged in columns under each of the large figures on the square.

The first row contains figures which give the length of a common or main rafter per foot of run. For a half pitch roof look under "12," for third pitch under "8," etc., 24 being taken as the denominator of the fraction. Under "12" in the row mentioned, 16.97 appears, which equals $\sqrt{(12)^2+(12)^2}$. Under "8" 14.42 appears, which equals $\sqrt{(12)^2+(8)^2}$. "Twelve" is squared together with the figure that gives the required rise and the square root of the sum is extracted.

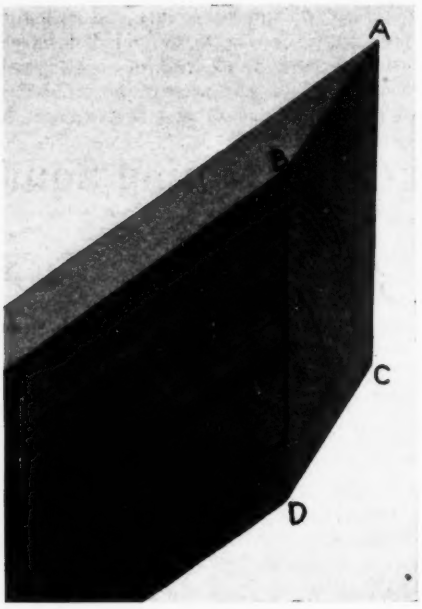
In the next row is given the length of hip or valley rafters per foot of run. Here as before we look under the large figure that gives the rise required. Since an ordinary hip or valley rafter runs at an angle of 45 degrees with the plates, when viewed from above, it is necessary to determine the diagonal of a rectangular parallelopiped. (A six-sided prism, all of whose faces are rectangles.) For half pitch each edge of the prism is 12″ in length and the diagonal is obtained by $\sqrt{(12)^2+(12)^2+(12)^2}$, which is 20.78. For third pitch 18.76 appears under the figure "8" in the second row down and is equal to $\sqrt{(12)^2+(12)^2+(8)^2}$. For quarter pitch look under "6", which gives 18.00 and is equal to $\sqrt{(12)^2+(12)^2+(6)^2}$. The "6", "8", and "12" represent the rise for the respective pitches one-fourth, one-third, and one-half. For the other pitches look under the figure which, with 24 as the denominator of a fraction, will give the pitch desired.

In the third row the common difference in length is given for jack rafters spaced 16″ apart and is found by the formula $\sqrt{(16)^2+(4/3 \text{ of rise per foot for pitch used})^2}$. For half pitch $\sqrt{(16)^2+(4/3 \text{ of } 12)^2}$ equals 22.625. For one-third pitch $\sqrt{(16)^2+(4/3 \text{ of } 8)^2}$ equals 19.23.

In the fourth row is given the common difference for jack rafters spaced 24″ apart and is found by the formula $\sqrt{(24)^2+(\text{two times the rise for pitch used})^2}$. For half pitch $\sqrt{(24)^2+(2 \text{ times } 12)^2}$ equals 33.94. For one-quarter pitch $\sqrt{(24)^2+(2 \text{ times } 6)^2}$ equals 26.83. Remember

to look under the figure giving proper pitch to verify these calculations.

In the fifth row is given the figure to be used with "12" in marking the line for the side cut of a jack rafter. This is a little harder to understand, but with the aid of the photographs little difficulty ought to be encountered. Surface ABCD represents the cut of a jack rafter that fits against the hip. AC is called the plumb cut and AB the side cut. To determine the line AB the square is placed on the surface G with figure "12" on the body of the square at point A. The tongue rests on surface G and the specific point on the tongue that is coincident with the line AR is determined by the pitch of the roof being considered. For half pitch "12" is used on the blade and "8½" on the tongue. The scribing for the side cut is done along the blade. For third pitch "12" is used on the blade and "10" on the tongue. These figures may

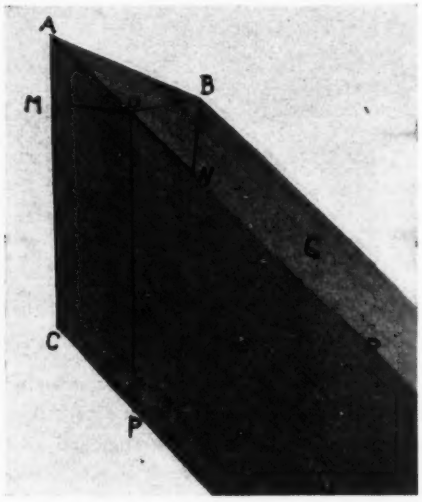


CUT OF A JACK RAFTER.

be derived as follows: Line AC is parallel to OP. Line MO is as long as the rafter is thick, in other words OB equals OM. BN is perpendicular to AB. AM represents the rise per foot for pitch used. In one-third pitch AM will be 8, MO will be 12, and OB will also be 12. By square root AO equals 14.42, and AB equals 18.76. By proportion from plane geometry AB : AO : : BN : BO. Substituting: 18.76 : 14.42 : : BN : 12. Solving: BN equals 15.61. But, reducing AB and BN proportionately so that AB equals 12, we see that 18.76 : 12 : : 15.61 : X. Solving: X equals 9.98. On the square for third pitch 10 is given which is very close to 9.98.

Similarly for half pitch OB equals 12, MO equals 12, AM equals 12, OA equals 16.97, AB equals 20.78. Solving for BN by 20.78 : 16.97 : : BN : 12 we find it equal to 14.63. Reducing AB to 12 and BN proportionately by 20.78 : 12 : : 14.63 : X we find X to equal 8.44, which is not far from 8½ given on the square for half pitch.

In the next row is given the figure to be used with "12" for obtaining the side cut of a hip or valley rafter. We can use the same figure for explanatory purposes as before, but the length of some of the lines will change. AM represents the rise per foot of run and remains the



ANOTHER VIEW OF A JACK RAFTER.

same, but MO and BO change. Instead of being 12 they now each represent 16.97, because these lines extend at an angle of 45 degrees with the plates when viewed from above. If we consider one-third pitch AM will equal 8, MO equals 16.97, BO equals 16.97, AO equals 18.76, and AB equals 25.29. BN equals 22.87 since 25.29 : 18.76 : : BN : 16.97. Reducing AB to 12 and BN proportionately by 25.29 : 12 : : 22.87 : X we find X equal to 10.85, which is very close to 10⅞ given on the square. This procedure will give the number for any pitch by using the proper rise for pitch considered.

These calculations were only carried two places beyond the decimal point and could be determined more accurately; but the carpenter seldom works to dimensions smaller than one-sixteenth of an inch anyhow. Do not think that a few minutes spent in reading this article will make the derivation of the figures on a framing square perfectly clear. Considerable thinking and some actual work in cutting rafters will quite likely be necessary before the explanations will seem clear. The framing square offers one of the nicest means of connecting up the shop with the work in mathematics. Few mathematics teachers care anything about the square, so it remains for the shop teacher to teach students to apply their knowledge in a practical way.

IOWA MEETINGS OF INDUSTRIAL ARTS TEACHERS

The Iowa Association of Industrial Arts Teachers, at its state meeting held each year at Des Moines, during the first week in November, has an attendance of all the delegates of the state and also representatives from the sectional meetings.

In the early spring, the state is divided into seven sections, each section holding its own meeting for the purpose of getting in closer touch with those who are not able to attend the state meeting. These sectional meetings, it is found, are centers of activity in which ideas are brought forth, discussed, tried out, and submitted to the state meeting for further discussion and approval. At the state meeting are taken up such matters as are of wide portent and may be successfully handled in the convention proceedings.

The state meetings for this year will occur during the month of April. A list of the meeting places and dates for the meetings follows:

Northeast	—Waterloo, Ia.	April 2, 3, 4
Central	—Des Moines, Ia.	April 9, 10, 11
Northwest	—Sioux City, Ia.	April 2, 3, 4
Southeast	—Muscatine, Ia.	April 2, 3, 4
South Central	—Shenandoah, Ia.	April 2, 3, 4
Southwest	—Council Bluffs, Ia.	April 2, 3, 4
North Central	—Fort Dodge, Ia.	April 2, 3, 4

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

A JOB SHEET FOR HOME MECHANICS

F. E. Tustison, Menomonie, Wis.

The following job sheet describes the making of the heating element for the completion of the electric toaster outlined in the February issue. The asbestos slate for the job can be purchased from the Central Scientific Co., Chicago, Ill., or direct from Johns-Manville Co., New York. The resistance wire described (climax) is manufactured by the Driver-Harris Co., Chicago, Ill. They also manufacture other grades of resistance wire. Wire can also be obtained from the Hoskins Mfg. Co., Detroit, Mich.

Job Sheet
Home Mechanics (Elec.)
The Stout Institute
F. E. Tustison

Job Specifications: To make the heating element and the electrical connections for the electric toaster.

Reason for Job: We found how easy it was to make an electrical heating element. Today we will make an element for the electric toaster. If you will recall, a former element consumed about three amperes. A larger toaster must consume about five or six amperes. A larger wire must then be used to conduct this greater amount of current.

Material: Asbestos slate ⅛", climax wire No. 22, 4⅜" brass machine screws 4-40 with hexagon nuts, 6 brass hexagon nuts for 12-24 thread, $\frac{3}{16}$" brass rod.

Tools: Saw, $\frac{3}{16}$" and ¼" twist drill, small stock and die for 12-24 threads, hack saw, mill file and element winder.

Procedure: (1) Cut, drill, and assemble the slates. (Fig. I). Measure carefully, cut and drill accurately. Small piece No. 2 is bolted to the projection No. 1 so that the saw kerfs are together. The two saw kerfs form a hole through which the element wire passes to connect to the tangs. If the saw kerfs are not used, holes can be drilled after No. 2 is bolted to No. 1. No. 3 is bolted under the oval slot and is used to support the two tangs.

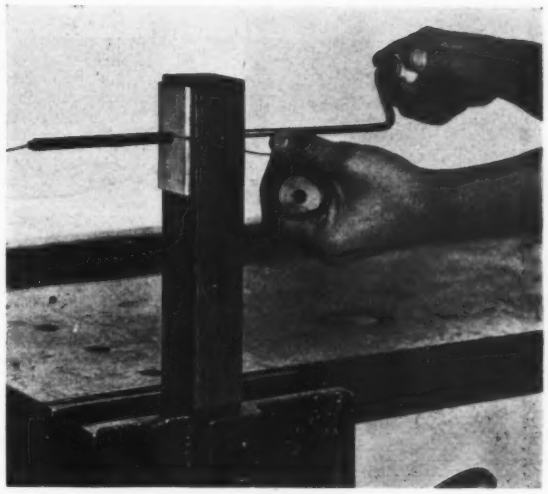


FIG. II—WINDING THE ELEMENT.

(2) Wind the element. (Fig. II.) An element winder can be made as shown. The ⅛" rod with the bent handle is inserted in a hole in the block. A piece of iron attached to the block will make the winder more permanent. Note the hack saw slot for guiding the wire. Wind with one hand feeding wire with the other. Cut 18½ feet from No. 22 climax wire and wind into a long coil leaving 8" at each end for connections. Double the 8" at the end and twist together. (See bottom of Fig. III).

(3) Divide the coil. Divide the coil into twenty euqal parts. Do this by measuring the length and dividing by twenty. Mark the twenty sections by separating coils with the knife.

(4) Thread coils on to the slate. (Fig. III.) Locate the center of the coils and start at the top threading one side at a time. Start so that the twisted end left for connection will fasten under the attached piece of asbestos slate. Do not stretch coil any more than necessary.

(5) Make and attach tangs. (Fig. IV.) The tangs are made from $\frac{3}{16}$" brass rod, 1⅝" long. Thread one end with 12-24 threads for ⅝". Chamfer the other end with a file so that the attachment plug will slip on easily.

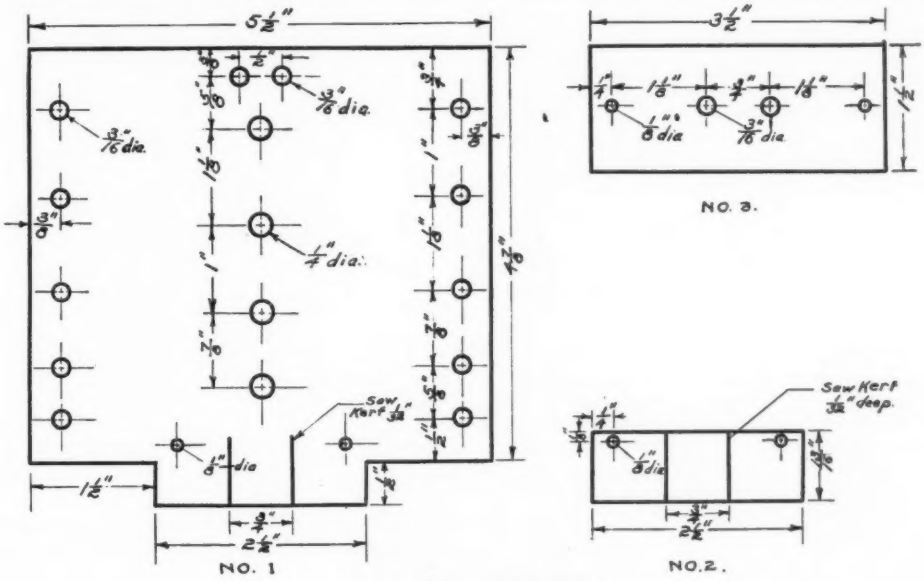


FIG. I—DETAIL OF SLATES.

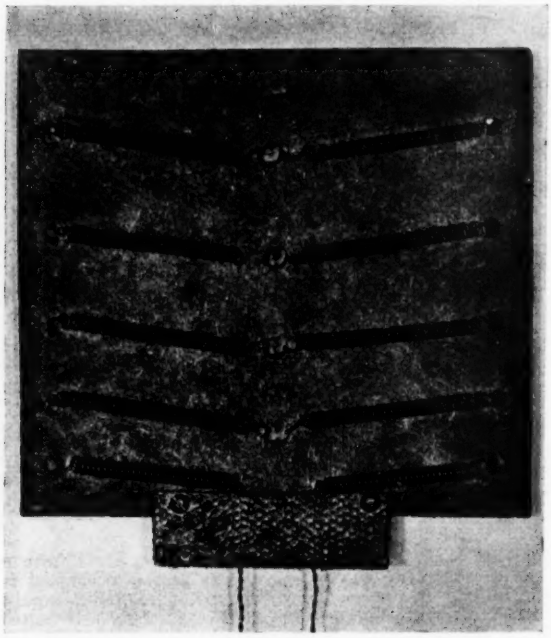


FIG. III—ONE SIDE OF COMPLETED ELEMENT. OPPOSITE SIDE CONTAINS THE SAME AMOUNT OF WIRE.

Fasten the tangs in place with two hexagon brass nuts.

(6) Insert the element in the frame. Remove the top and slip the element into place. Remove and file for any misfit. Attach the wires to the two tangs by adding another hexagon nut. Replace the top.

(7) Test. Connect the toaster and try with a piece of bread. The bread should toast with an even brown color.

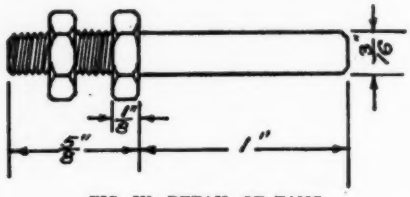


FIG. IV—DETAIL OF TANG.

Questions:

(1) What determines the amount of current a toaster uses?

(2) Why use larger wire in today's element?

(3) Why use asbestos slate?

(4) What is sometimes used instead of asbestos in other toasters?

References:

Keene: Mechanics of the Household, pp. 330-331.

Record:

Name..... Class.....

Date begun..... Date finished.....

Have you answered all of the questions?.....

Instructor's Grade.....

A METHOD OF FINISHING INTERIOR WROUGHT IRON WORK

Thomas F. Googerty

Decorative wrought iron made for the interior of buildings or houses should not be painted or electroplated. This finish destroys its character and takes away the beauty from this metal, at least in my opinion. Wrought iron work should not be finished with files, only where it is absolutely necessary. The work should show the rugged character of the material. The blows of the hammer add beauty to the metal, which cannot be obtained in any other way. Care should be taken in finishing a piece of iron with the hammer. The marks should surface and should be made with the flat face of hammer. Do not use the ball of the hammer to mark iron. These marks must be the result of the hammer in the making of the piece and not merely for the sake of making marks.

Most any piece of decorative iron made in the school shop can be improved wonderfully in its final finish. All of the sharp edges should be smoothed with a file. Afterwards heat red and cool to get a good fine coat over it. It should then be smoothed with emery cloth, care being taken to only rub the high places and leave the dark fire coat in the low parts. All of the projections should be smoothed down to a polish. This makes the work sparkle with life and gives it beauty. Of course the metal will not stay bright unless it is treated with some preparation to exclude moisture. A preparation that will do this and is invisible has been hard to obtain. One that I have used very satisfactorily is made from turpentine, varnish, and bees wax. I have found that metal will last indefinitely and retain its brightness provided it does not come in contact with water.

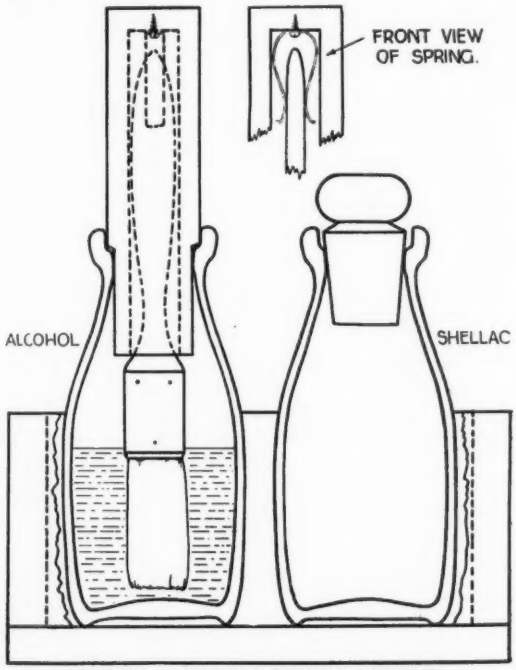
In preparing the mixture, about ten per cent varnish should be used with turpentine and about five per cent bees wax. The bees wax should be dissolved in turpentine. Put the turps in a bottle, add the piece of wax, and set the bottle in hot water. Afterwards put in the varnish. This preparation should dry flat unless too much varnish has been used. It is well to use all the varnish possible, but the mixture must dry flat and not have a gloss in the dark places on the work. The mixture can be applied with a rag. Rub it on well and then rub it off; enough will remain. Give it another coat when dry. Bees wax cut with turps, to a thick paste can be used afterward in the way used in finishing woodwork. This gives it another coat which will exclude moisture and add beauty to the work.

THE CARE OF THE SHELLAC BRUSH

Luther E. Hail

The accompanying diagram illustrates how I solved the problem of caring for the shellac brush. Ordinary half pint milk bottles, or any wide mouthed bottles available, were provided and stoppers turned from pine or basswood and drilled to allow for the handle of the brush.

The bottles are in pairs; one contains shellac, the other is for alcohol and the brush. The brush is returned to the alcohol when not in use. An ordinary varnish can stopper may be turned from basswood for the shellac bottle.



DETAILS OF SHELLAC BRUSH CONTAINER.

A small box is constructed from one-half inch basswood, large enough to hold the two bottles side by side with about a half inch clearance on all sides and deep enough to extend above the point where the curvature of the bottle starts. Plaster of paris is then poured into the box around the bottles.

A number of these are provided and one pupil from each class cares for them; he sees that they are returned to the cabinet and refills them when necessary. Each bottle is properly labelled. They cannot be easily upset and are always available in a form convenient to use and convenient to care for.

The brush is held in suspension in the alcohol by means of a small brass spring fastened to the handle.

Our paint, turpentine, and linseed oil are cared for in the same manner. This time the bottles are in sets of three; one for the paint, the second for turpentine, and the third for the linseed oil. One set is provided for each color of paint.

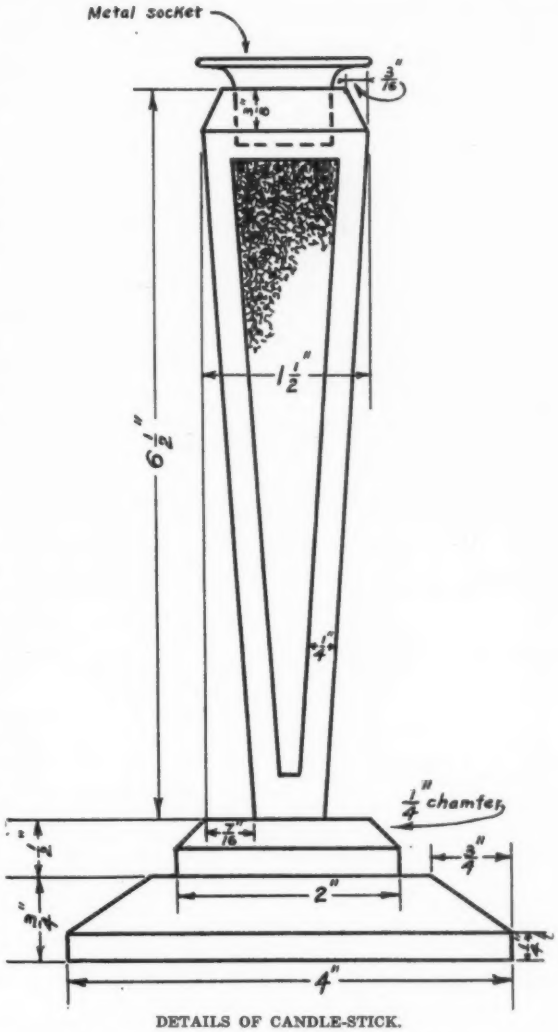
A SIXTH GRADE PROBLEM

Jos. J. Lukowitz, Instructor of Manual Training, Greenbush Street School, Milwaukee, Wisconsin

The accompanying drawing illustrates a problem which has been found to be very successful in the sixth grade shop work. It appears extremely simple in the drawing, but the finished article will redeem itself. Here is a chance to illustrate quite a number of tool operations with a minimum amount of material. Here, also, is a chance to show the boys how easily and effectively a surface may be enriched.

A pleasing two-tone effect is obtained by simply staining the entire candle-stick with one coat of the same stain, and then rubbing off all excess stain. The stain will penetrate the panel more deeply, because of its pierced and roughened surface, and the result will be a harmonious contrast between the panel and the rest of the project.

THE COMPLETED CANDLE-STICK.



DETAILS OF CANDLE-STICK.

Those of us who work with beginners in shop work have formed the conviction that the boys learn more than they make, and that what they make is but the inevitable by-product of what they learned. The days of drill, drill, drill, on joint making have passed. In that extremely formal type of manual training the by-product was worthless. But today, our drill is motivated by practical and useful problems which compel interest and appreciation. To the boys the finished product is the coveted goal, and it is up to us as teachers to set a worthy goal for our young charges, and then to guide them so that they may experience that encouraging sense of achievement which comes from the realization of a job well done—it is then that our educational efforts will bear the most fruit.

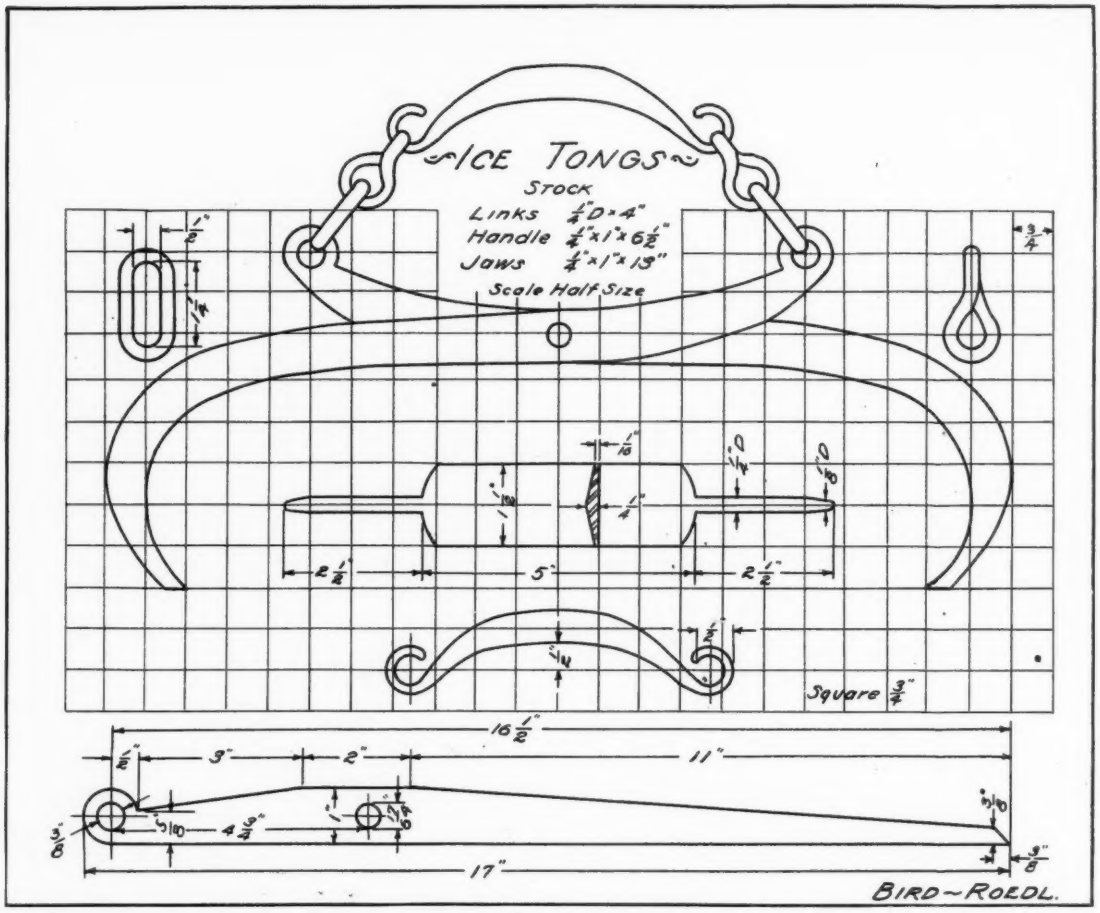
ICE TONGS

James P. Bird and Leo J. Roedl, Kansas City, Mo.

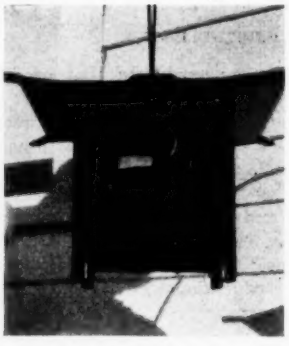
All homes have use for ice tongs, and as these involve several fundamental forging operations, they make a good project. The metal must be drawn, the eye punched and formed, the jaws bent to a templet, the links welded, and making the handle involves the use of fuller, flatter, and swage block. The jaws are also riveted and the points case-hardened.

In making the jaws a piece of stock ¼"x1"x13" will be sufficiently large. The eye is the hardest to form and should be made first. If the first eye is spoiled, it may be welded up, and another made on the other end.

Let the stock extend one inch beyond the round corner of the anvil and neck the stock down to ⅝ inch. Round up the end to one inch. Draw the other end out

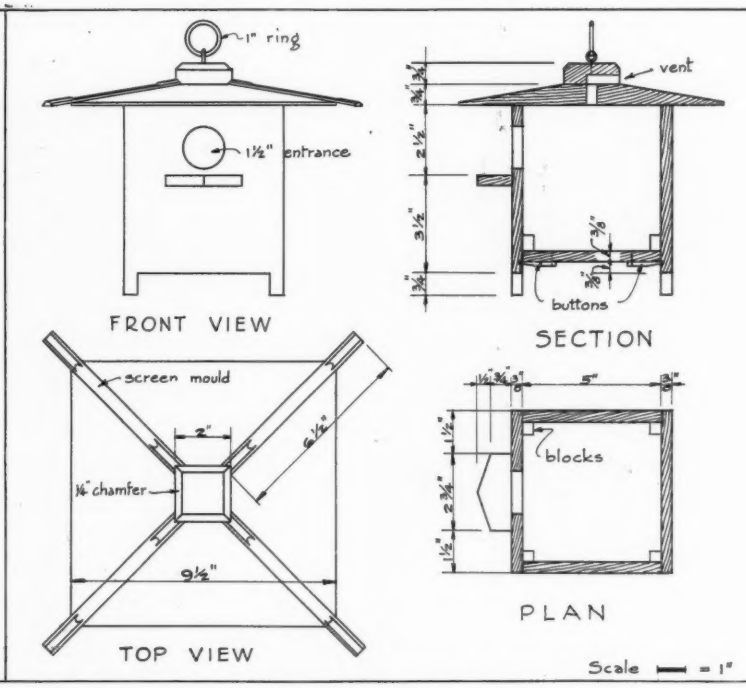


DETAILS OF ICE TONGS.



BLUEBIRD HOUSE
BILL OF MATERIAL

1	PC	3/4" x 9 1/2" x 9 1/2"	TOP
1	PC	3/4" x 2" x 2"	CAP
2	PC	3/8" x 5 3/4" x 6 3/4"	FRONT & BACK
2	PC	3/8" x 5" x 6 3/4"	SIDES
1	PC	3/8" x 5" x 5"	BOTTOM
1	PC	3/8" x 1 1/4" x 2 3/4"	PERCH
4	PC	6 1/2"	SCREEN MOULD
2			BUTTONS & SCREWS
1			1" RING & SCREW EYE



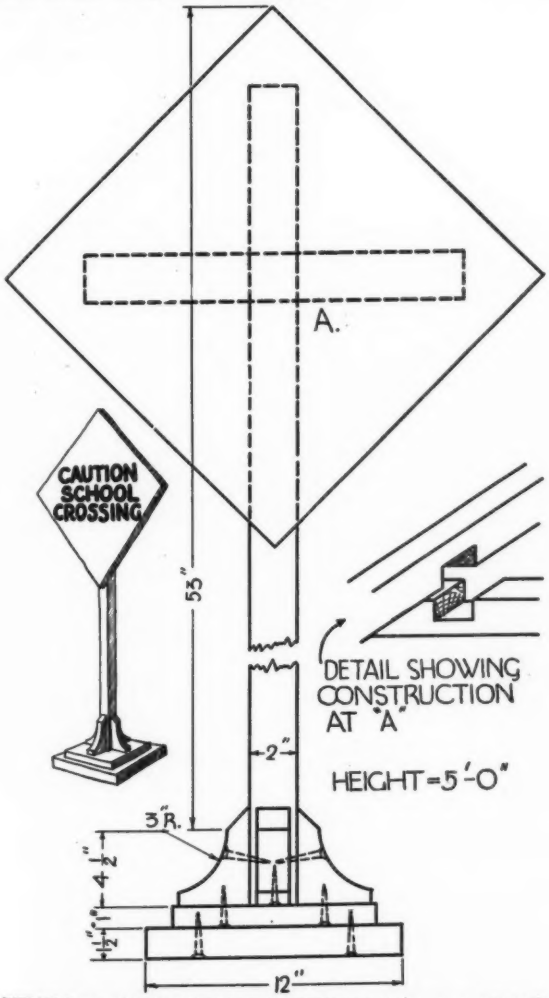
DETAILS OF A BIRDHOUSE DESIGNED AND MADE BY THE STUDENTS OF MR. GLADSTONE CALIFF, INSTRUCTOR IN SHOPWORK, RICHLAND, IOWA.

to correct dimensions, and make the second jaw conform to the first. Bend the two to fit the templet. Punch the eye and work the stock around the eye into circular cross-section. The handle takes a piece of stock ¼"x1"x6¾". From the center lay off 2½" both ways. At the 2½" mark, fuller in with ⅜" in top and bottom fullers, until the neck measures ⅜". Work both ends down to ⅜" square. Spread the 5" of the center by fullering until it measures 1¾" wide. Now trim the edges so as to make the central portion of the handle 1½" wide. Work the ends to finished dimensions. Next, bend the central part in the swage block, so that it becomes a semi-circle of one inch diameter. After this curve the same part over the horn of the anvil as per blueprint. The eye of the handle should be bent last. The links are next welded in place and the jaws riveted. File the points and case harden about one-half inch.

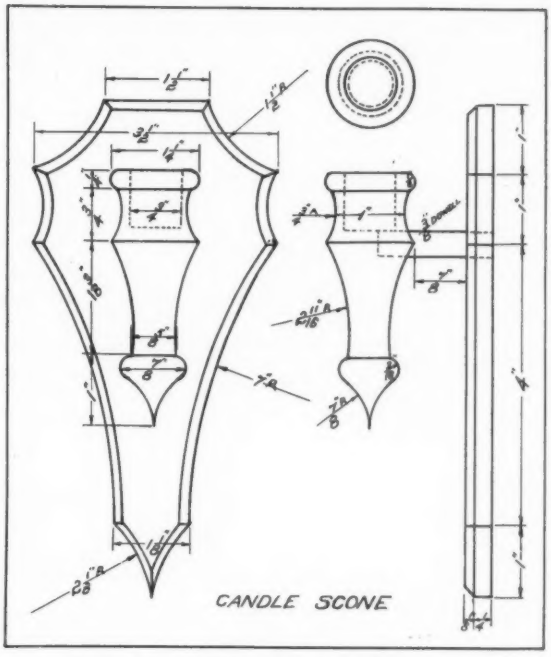
TILT-TOP TABLE

A. E. Bidney, Milwaukee, Wis.

The modern home has need for a variety of tables for decorative purposes and for a multitude of services. As a result, the tilting-top table has become very popular during the last few years, furniture factories imitating the tables of Chippendale and Phyfe. Tilt-top tables blend with most any period furniture; when not in use by a window or reading chair their tops may be tilted to display the design or beautiful figure of the wood and placed in a corner or against a wall space.



DETAILS OF SAFETY PROJECT DESIGNED BY MR. C. A. KUNOU, LOS ANGELES, AND MADE IN THE GRADES OF THE LOS ANGELES SCHOOLS.



DETAILS OF CANDLE SCONE, DESIGNED BY MR. J. L. MIDDAUGH, BENTON HARBOR, MICH.

The author designed this table, keeping in mind the characteristic features embodied in a table of this kind, which always has the tripod base—namely, three curved legs supporting the pedestal and oval top.

TILT TOP TABLE.

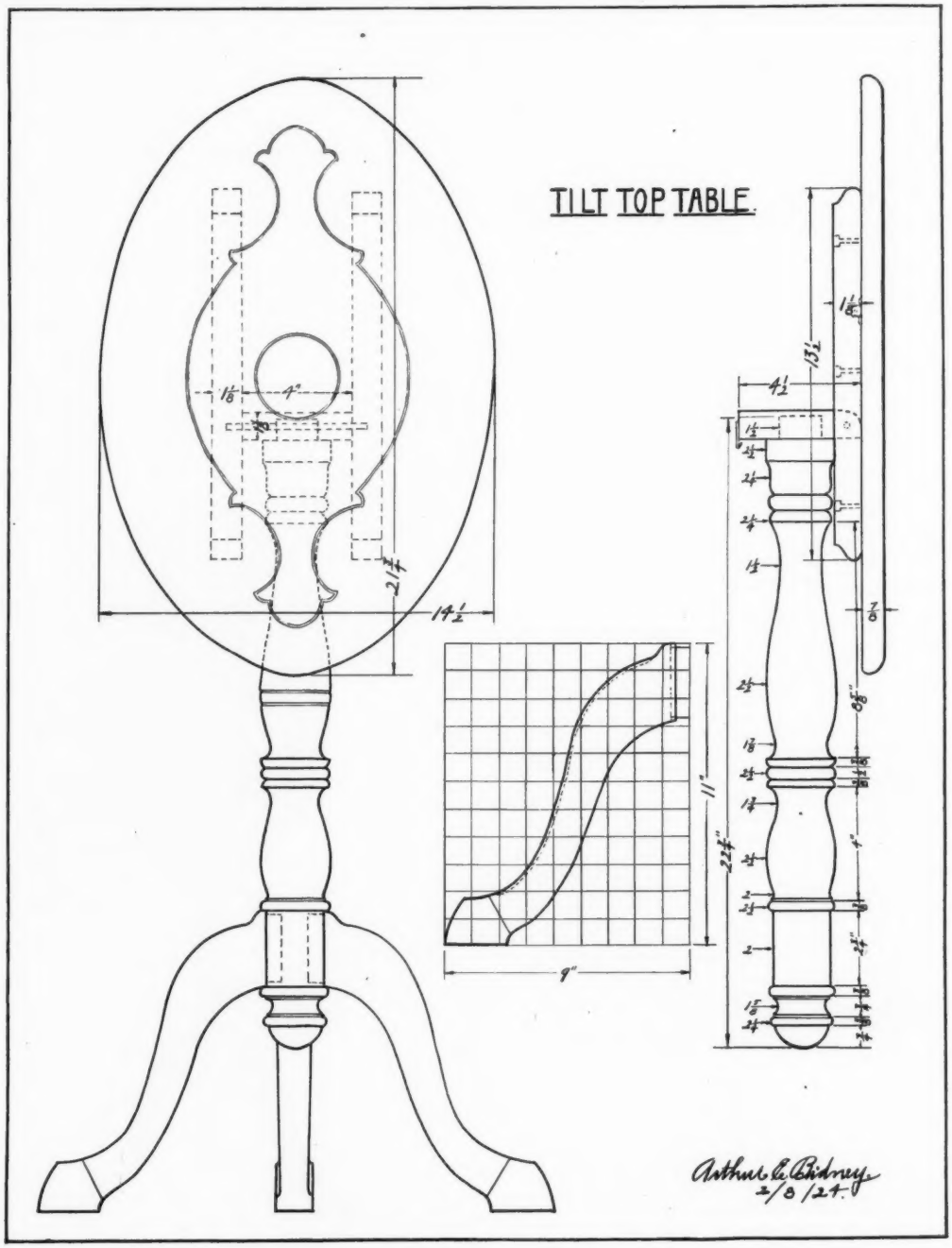
The top is held down by a small elbow catch and a bolt serves as a hinge. There is nothing particularly difficult or involved in the construction of the table, excepting the concave shoulders on the tenons.

Of course a table of this kind should be made of the better cabinet woods, this one being made of solid walnut and stained dark. The top was finished in the two tone effect, the design being left natural. Shellac, rotten-stone and wax were used in the finishing.

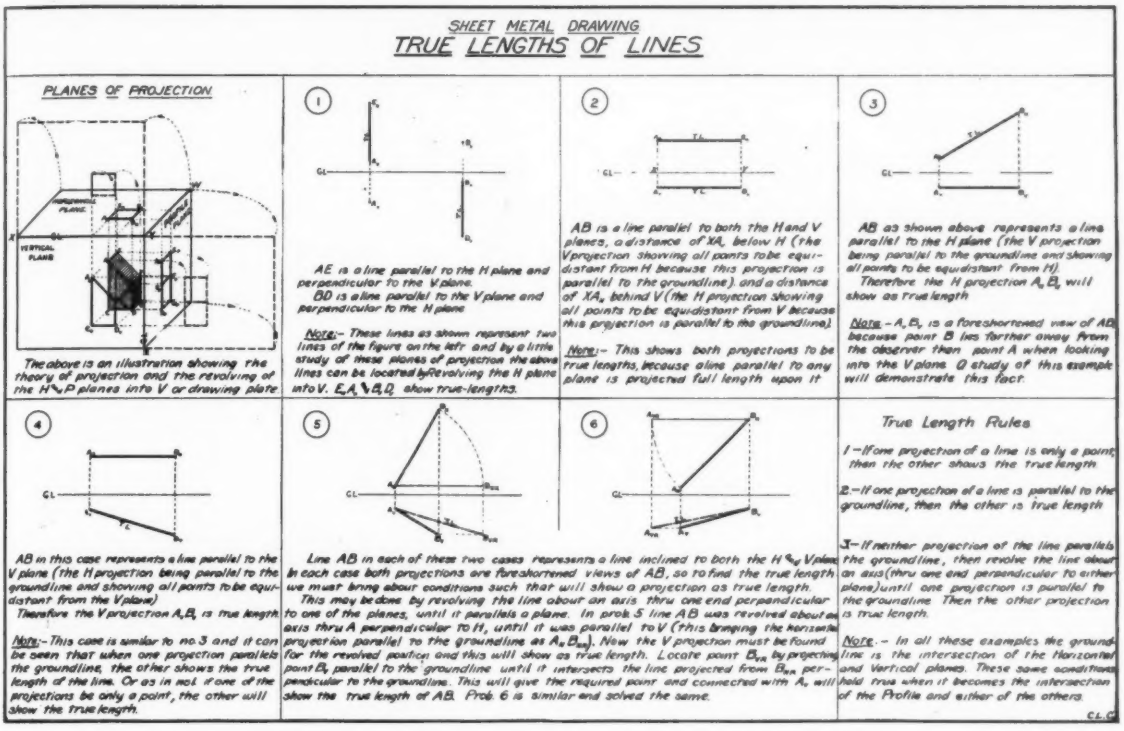
TRUE LENGTHS OF LINES IN SHEET METAL DRAWING

Charles L. Conroy, Vocational School, Manitowoc, Wis.

It has been the writer's experience in teaching sheet metal drafting that the majority of students have considerable difficulty in understanding the finding of true lengths of lines, especially of a line which is inclined to both planes it is projected onto. This condition is due to the fact that most students of mechanical drawing do not get a definite understanding of the principle upon which this subject is based — orthographic projection. That is, the relation of views, the reason why most drawings follow a certain plan, such as the top view being in the upper left part of the drawing plate, the side view directly beneath, and the end view in the lower right directly opposite the side view. Very few know what is meant when we say that our drawings are based on third-angle projection. Of course this may involve a slight amount of the fundamentals of descriptive geometry, but



DETAILS OF TILT TOP TABLE.


SHEET METAL DRAWING
TRUE LENGTHS OF LINES
PLANES OF PROJECTION
The above is an illustration showing the theory of projection and the revolving of the H & P planes into V or drawing plate
1
AE is a line parallel to the H plane and perpendicular to the V plane.
BD is a line parallel to the V plane and perpendicular to the H plane
Note:- These lines as shown represent two lines of the figure on the left and by a little study of these planes of projection the above lines can be located by revolving the H plane into V. E,A, & B,D, show true-lengths.
2
AB is a line parallel to both the H and V planes, a distance of XA, below H (the V projection showing all points to be equidistant from H because this projection is parallel to the groundline), and a distance of XA, behind V (the H projection showing all points to be equidistant from V because this projection is parallel to the groundline).
Note:- This shows both projections to be true lengths, because a line parallel to any plane is projected full length upon it
3
AB as shown above represents a line parallel to the H plane (the V projection being parallel to the groundline and showing all points to be equidistant from H).
Therefore the H projection A, B, will show as true length
Note - A, B, is a foreshortened view of AB because point B lies farther away from the observer than point A when looking into the V plane. A study of this example will demonstrate this fact.
4
AB in this case represents a line parallel to the V plane (the H projection being parallel to the groundline and showing all points to be equidistant from the V plane)
Therefore the V projection A, B, is true length
Note:- This case is similar to no. 3 and it can be seen that when one projection parallels the groundline, the other shows the true length of the line. Or as in no. 1 if one of the projections be only a point, the other will show the true length.
5
Line AB in each of these two cases represents a line inclined to both the H & V planes. In each case both projections are foreshortened views of AB, so to find the true length we must bring about conditions such that will show a projection as true length.
This may be done by revolving the line about an axis thru one end perpendicular to one of the planes, until it parallels a plane. In prob. 5 line AB was revolved about an axis thru A perpendicular to H, until it was parallel to V (this bringing the horizontal projection parallel to the groundline as $A_H B_{H_1}$). Now the V projection must be found for the revolved position and this will show as true length. Locate point B_{V_1} by projecting point B_1 parallel to the groundline until it intersects the line projected from B_{H_1} perpendicular to the groundline. This will give the required point and connected with A_V will show the true length of AB. Prob. 6 is similar and solved the same.
6
True Length Rules
1 - If one projection of a line is only a point, then the other shows the true length
2 - If one projection of a line is parallel to the groundline, then the other is true length
3 - If neither projection of the line parallels the groundline, then revolve the line about an axis (thru one end perpendicular to either plane) until one projection is parallel to the groundline. Then the other projection is true length.
Note - In all these examples the groundline is the intersection of the Horizontal and Vertical planes. These same conditions hold true when it becomes the intersection of the Profile and either of the others.
C.L.C.

A HELP FOR THE SCHOOL DRAFTING ROOM AND THE SHEET METAL SHOP.

I have found it highly profitable in the long run to spend a little time clearing this matter up right in the beginnng of a drawing course.

The projection box is an old idea and a mighty good one although it is not used as much as it might be. We made one for this department last year, one that is practical, easily demonstrated, not fragile or bulky, and easy to construct. I purchased three sheets of celluloid from the Dietzgen Co., (10"x10"x⅛") and these form the horizontal, vertical, and profile planes of the projection box, illustrated in the accompanying drawing. These are hinged with four small brass butts which can be bought at a local hardware store. The ones we used were about ¾" square with four holes about ⅛" diameter. The screws I picked out at the same time to fit these holes. To locate the holes place the planes and butts in a flat position as shown and mark positions of screw holes. I was unable to find a small tap, so drilled the holes small enough so I could turn the screws in (The celluloid will permit this as it is fairly soft) and cut their own threads in these holes. The hinge detail will show this construction. The base board is of white pine; the slots are sawed in to give a slip fit on the plane edges, and holes are drilled to hold the H plane supports. Cleats were screwed into the bottom to prevent any warping. For an object to represent a line I use a ¼" dowel 7" long with a long needle pressed into one end and sharpened on the outer end. This allows the dowel to be placed in any position and look suspended behind the planes. I then put a thin coat of white shellac on the outer plane surfaces to take chalk markings; with the object in position, its projections can be drawn upon the respective planes. There have been several constructions of this type of box shown, but this has proven to suit our needs better than the rest.

In my effort to bring out this matter of true lengths clearly, I made a chart which is shown here also, to illustrate the types of lines usually found and worked with in sheet metal drafting. These I divided into six cases. On the upper left of the chart is illustrated the idea and operation of the projection box with the object therein, a truncated rectangular prism. A study of this illustration will show its principles and with a little explanation the theory of finding true lengths is understood. In example No. 1, both lines will be noticed to be lines found on the object shown. Likewise with examples Nos. 2 and 4. Nos. 5 and 6 are not shown within the projection box illustrated for I leave it to the student to take the needle pointed dowel representing a line and place it in such a position that its projections can be drawn. Then he is told to revolve the line in the proper manner to have a projection show as true length. The various projections can be marked with a sub letter to distinguish them such as AH BH meaning the H projection of line AB. After this is mastered it can be shown that there are three possible ground lines to be considered, some developments calling for one, some for another.

I find this method of locating true lengths directly off the drawing saves considerable time and paper space. Of course there is the method of laying off true lengths to one side of the drawing by the use of right-angled triangles showing the base and altitude; in some cases it may be better to use it. But my results have been better with the above-mentioned method. I find some practical sheet metal men who rave about the schools not teaching the up-to-date methods of today such as Neubecker's short methods, etc. I can hardly agree with this attitude in the early part of the work, but I do think an instructor of this work should be thoroughly familiar with the advanced short methods to enable the brighter and quicker student to gain this knowledge is possible.

In summing up: it would pay us well for our efforts to put the student of both mechanical and sheet metal drawing on a better speaking acquaintance with this matter of projection, and instead of his gaining a more or less memory course in remembering certain operations to gain certain ends, he would understand every step and know where he was at every moment and why he was there. Even in vocational schools where many students lack a knowledge of geometry, this matter can be impressed on students if presented properly.

MISS SNOW PASSES ON

The news of the sudden death, on January tenth, of Bonnie E. Snow, who was for so many years identified as a pioneer and leader with the most progressive movement in public school art education, came as a great shock to her many friends and associates.

Miss Snow had not been in her usual health last fall, but felt well enough to attend, on January ninth, a meeting of the Art Section of the New York Society for the Experimental Study of Education. She was chairman of this section, and presided at the meeting. While she returned very tired, her family felt no especial cause for alarm. The end came that night, without warning. This was her last service to the cause to which she had given so many years of her life.

Miss Snow began her career as art instructor in the public schools of Batavia, Illinois, her childhood home. In Aurora, Illinois, and later in Minneapolis, Minnesota, where she was supervisor of art for a number of years, she continued her chosen work with constantly increasing success and recognition. When the Prang Company, the well-known art education publishers, invited her to direct their editorial policy, in association with Hugo B. Froehlich, she accepted, and continued in that field until some ten years ago, when, in fulfillment of a long cherished desire, she established at Millburn, New Jersey, the Snow Studio, which was, thenceforth, to be her workshop and her home.

With Mr. Froehlich, Miss Snow was author of a number of works in the field of art education. The most important of these are "The Textbooks of Art Education," "The Progressive Drawing Books," "Art Education for High Schools," "The Industrial Art Textbooks," "The Theory and Practice of Color," "A Hundred Things a Girl Can Make." At the time of her death she was engaged, among other activities, in the editing of the little magazine *Everyday Art,* the freshness and sincerity of which has made such an appeal to public school art teachers throughout the country.

If today the teaching of art in our schools has reality and purpose, if we recognize in our teaching that art is universal and has a universal appeal, if art's message of beauty is going out through the children, not to the privileged few alone, but to every life, it is due, in very great measure, to the clear vision, the strong belief, the enthusiasm and unselfish devotion of Bonnie E. Snow.

AN APPRECIATION OF MISS SNOW'S WORK

By Edwin Osgood Grover

The death of Bonnie E. Snow, which occurred in New York on January 10th, is a tragic loss to the industrial art movement in this country. Her last day was spent in presiding at a convention of art teachers, and she passed away in her sleep during the night.

It was Miss Snow's good fortune to be the first—with Mr. Hugo B. Froehlich—to organize and put in practical form a graded course in industrial art. She was a pioneer in the field of public school art as Dr. James Parton Haney was in the high school field, and as Frank Alvah Parsons still is in the professional field. To the last she was open-minded and eager for new ideas. Her greatest pleasure was the discovery of a simple way to present an abstruse or technical point. She was a natural born teacher with a cultivated and trained mind enriched by long experience.

As a student at Pratt Institute she showed her special gift for clear and logical thinking. As supervisor of art in Minneapolis, Minnesota, she proved her remarkable executive ability and her capacity for transferring her enthusiasm for art and beauty to little children. Her work in Minneapolis gave her a national reputation as an art teacher and supervisor.

MISS BONNIE SNOW.

In 1902 she was invited to become a member of the editorial committee in planning the "Textbooks of Art Education," to be published by the Prang Company. Other prominent members of this committee were Miss Wilhelmina Seegmiller, of Indianapolis; Mrs. M. E. Riley, of St. Louis; Dr. Hugo Munsterberg, of Harvard University, and Walter Scott Perry of Pratt Institute. Soon after this she resigned her position in Minneapolis to become, with Mr. Hugo Froehlich, editor for the Prang Company, where she remained for more than twelve years. During this time she established herself as an editor and author of notable ability, as evidenced by several series of drawing books edited by her. Undoubtedly her greatest contribution to the teaching of art was made in the Industrial Art Textbooks, which presented the first graded course in industrial art published in America.

At that time the industrial art movement did not exist. Such men as Haney and Parsons had already begun to preach the gospel of "art for life's sake," but the publication of these Textbooks of Industrial Art brought the issue before thousands of art teachers throughout the country. Miss Snow lived to see the industrial art movement, which she had so large a part in promoting, become nation-wide and accepted by practically all art workers.

For the past eight years Miss Snow devoted her winters to lecturing and to her own editorial and literary work at her beautiful studio-home in Milburn, New Jersey. Here, surrounded by her lovely garden full of flowers and birds and squirrels, she did her creative work under ideal conditions. From the windows of her studio one could look for ten miles across Newark Bay and no one of the hundreds of friends and teachers who visited her there, can forget the beauty of the setting, or the inspiration of the long look from her hill-top studio out to open sea.

During the summer Miss Snow gave herself without reserve to teaching in the summer session of the School of Industrial Art. Hundreds of young and ambitious

teachers of art have received their first encouragement as well as instruction from Miss Snow. She was generous minded to a fault and while her life among us is ended, her memory and influence will continue for years to come to make the world better and more beautiful. Few teachers have made so notable a contribution, or lived to see the result of their labors so widely approved, or their early judgment so completely justified. Miss Snow's death comes as a great personal loss to her many friends, but their lives are richer for what she gave.—*Edwin Osgood Grover.*

DEATH OF FRANK H. SHEPHERD

Frank H. Shepherd, formerly head of the department of industrial education at the Oregon Agricultural College, dropped dead from heart disease while at work in the basement of his home at Beaverton, Oregon, Wednesday, December 31st, 1924. His widow, Mrs. Jennie Shepherd, and two sons, Frank and Robert, survive. He was 58 years old.

FRANK H. SHEPHERD,
Beaverton, Ore.

Mr. Shepherd came to Oregon Agricultural College in 1913 from Jacksonville, Ill. He was the second man added to the department of industrial education. He was later selected by the Government to take charge of industrial education in all of the Pacific northwest states. During the war he was director of vocational education for the soldiers and camps in Washington, Oregon, Idaho, Montana, Wyoming, and Utah.

After the war Mr. Shepherd organized and established a department of vocational rehabilitation for the Oregon state industrial accident commission. When this department had been thoroughly established, he went to Chicago as director of vocational guidance for a Chicago society for education of the deaf. Because of poor health he returned to Oregon and went to Beaverton to establish a poultry ranch.

Mr. Shepherd was widely and favorably known among vocational and manual-arts schoolmen, and was a familiar figure at conventions. He was noted for his enthusiasm and common-sense view of educational problems and progress.

DEATH OF EDWIN SNYDER

Dr. Edwin R. Snyder, president of the State Teachers' College of San Jose, Calif., died on January 13th, in a San Jose hospital, following an illness of several months' duration.

Dr. Snyder had been president of the San Jose Teachers' College since September, 1923. Prior to becoming head of the college, he served as state commissioner of vocational and industrial education, with headquarters in Sacramento. He was California's first vocational director and as such was credited with having organized the work. Dr. Snyder was at one time superintendent of schools at Santa Barbara, and earlier in his career was vice-president of the old state normal school at Fresno, now a teachers' college.

DR. E. R. SNYDER,
San Jose, Calif.

Dr. Snyder was 52 years of age. He is survived by a widow and two children.

Funeral services for Dr. Snyder were held on January 15th at San Jose. Representatives of the state school department were in attendance.

MEETING OF THE FEDERATED COUNCIL ON ART EDUCATION

Representatives from the Eastern Arts Association, the Western Arts Association, the American Institute of Architects, and the American Federation of Arts met on Monday, December 29th, at the Art Institute, Chicago, for the first meeting of the Federated Trade Council on Art Education. At the meeting, action was taken in fulfillment of resolutions prepared by the Western Arts Association in May, 1924, and subsequently passed by each of the associations mentioned. Those present included Royal B. Farnum, James C. Boudreau, and Frances Bacheler of the Eastern Arts Association; Mary C. Scovel, William Whitford, and Bess E. Foster of the Western Arts Association; Thomas Tallmadge and Holmes Smith of the American Institute of Architects; C. Valentine Kirby (for Leon L. Winslow), and Florence N. Levy, of the American Federation of Arts.

The meeting was opened by Mary C. Scovel, who welcomed the members and stated the history of the movement up to the present time. Mr. Raymond O. Ensign, of the Art Institute, welcomed the visitors to the city. A paper on "Cooperation of Art Schools for Better and Broader Results" was read by Mr. Royal B. Farnum, while the subject of "Art Education in Smaller Communities" was ably handled by Mr. C. Valentine Kirby. Miss Bess E. Foster talked on the subject of "Public School Art Education," and Mr. Cyrus W. Knouff told "How Commercial Organizations Interested in Art Education May Help the Movement."

At the business session, Mr. Farnum was appointed temporary chairman and Miss Bacheler temporary secretary. The details of organization, which were outlined by a committee appointed for the purpose, then presented a report of its work. The name of the new organization is the Federated Council on Art Education, and its purpose is to initiate investigations, to make studies in the field of education, and to publish the findings of the council for general use.

Following the adoption of by-laws, the Council elected the following officers for the ensuing year: President, Royal B. Farnum, Boston, Mass.; Vice-President, Mary C. Scovel, Chicago, Ill.; Secretary-Treasurer, Leon L. Winslow, Baltimore, Md. It will be the work of the President to formulate plans for the work to be undertaken and to prepare a program for submission to the Council members at a later date.

BOSTON SOCIETY HOLDS ANNUAL MEETING

Frederick Ames Coates

The annual get-together dinner of the Vocational Education Society of Boston was held at the Hotel Bellevue Saturday, January 10, at six o'clock. This event regularly attracts a larger proportion of the membership than the monthly meetings, which are held Saturday noon, and

provide a yearly opportunity for a reunion to many who are unable to attend at other times. A total of 83 members were present.

As an aid to inculcating the proper spirit for the dinner and the general good time which followed, grotesque paper hats were distributed and were donned by all present. Each member was pleasantly surprised to find at his table place a large manilla envelope containing souvenirs which had been donated by a number of firms interested in vocational education and manual training. These souvenirs ranged from fountain pens and magazine pencils to machinists' handbooks, and constituted a veritable "prize package." Toward the donating firms, and toward the efficient chairman of the entertainment committee, Mr. J. Maynard Cheney, who made possible this expression of their interest and good will, the deepest appreciation was felt and expressed.

Serious problems and policies were relegated to the background, and the general spirit was that of "a night off." The camaraderie and general friendliness displayed could scarcely be duplicated in any other group of teachers. If it did nothing more than to nourish such an esprit de corps as was displayed, the Society would have more than justified its long and honorable existence.

Before the coffee had been removed, a vaudeville team of black-faced comedians set the gathering into roars of laughter. Some omniscient little bird must have furnished them with information, since a number of their hits were ludicrously and appropriately directed at members of the Society who were present.

Led by Mr. George Hatch, assistant director of manual arts of the Boston schools, many old-time songs were sung by the members.

The principal business of the evening was the voting on candidates for membership. After the reading of the applications, the secretary was instructed to cast a single ballot for the entire list, which comprised 25 names of men all of whom are directly and professionally interested in either vocational education or manual training.

President Daniel H. Shay called for a few informal remarks on a man who needed no introduction, Mr. John C. Brodhead, assistant superintendent of schools of Boston, and one of the charter members of the Society. Mr. Brodhead responded very fittingly, taking as his general theme the importance of the human, personal contacts made in daily work, whether in the work of a teacher or that of a supervisor. In his talk he referred to the sad incident which had brought this topic to the foreground of his mind: the recent death, in a hospital fire, of a young lady who had been his secretary, and who was known to very many of the members.

Mr. Edward M. Sullivan, introduced by President Shay as the youngest man ever elected to membership on the Boston School Committee, was the speaker of the evening. Mr. Sullivan's subject was "The Problems of the School Committeeman in a Large City," and he treated it in a manner befitting the spirit of the occasion, relating many humorous but true incidents which had forced themselves upon him in his official capacity. Among them was one which developed a novel definition of The Ideal School from a novel viewpoint—that of a janitor. A certain schoolhouse custodian, related Mr. Sullivan, appealed to him for a transfer. "I want a school," declared the appellant, "which will be a large school, where I can have plenty of assistants; which will be modern, easy to heat, easy to clean, and which will pay a lot of money!"

Turning to the serious, Mr. Sullivan paid tribute to those types of education which instead of restricting their appeal to the comparatively small high school group, offer valuable training in preparation for life's work to the vastly larger group of boys and girls who do not go to high school.

Announcement was made of the convention of the Eastern Arts Association at Springfield in the spring, and a committee, headed by Mr. Greener of the North Bennett Street Industrial School, was appointed to cooperate with the Association.

Mr. Greener will be the host to the next meeting of the Society, which will be held in his school Saturday, February 14.

IOWA ASSOCIATION OF INDUSTRIAL ARTS TEACHERS

In the state of Iowa for several years there has been in operation an organization, the sole purpose of which is to further the work of industrial arts in the state. The organization is the Iowa Association of Industrial and Manual Arts Teachers, and its purpose is to get together for the exchange of ideas, the improvement of standards, and for a better general understanding among those engaged in the work in the state. It meets as a body once a year, in November, during the Iowa State Teachers' Association Convention, held at Des Moines, and once a year in the spring in seven sectional meetings distributed over the entire state. These sectional meetings serve to unify much of the work in the various sections that cannot be completely covered by the state meeting, and thus give all interested, first-hand information.

WM. R. BAKER,
President Iowa Association of Industrial and Manual Arts Teachers,
Sioux City, Iowa.

At the 1924 state meeting on November 6th, 7th and 8th, two special afternoon sessions and a banquet were held in addition to the general program. At these afternoon meetings, many helpful suggestions came to light.

At the banquet, the following officers were elected for the ensuing year: William R. Baker, Sioux City, President; W. T. Bickel, Washington, Vice-President; L. G. Bennett, Des Moines, Secretary; H. W. Carmichael, Des Moines, Treasurer; R. H. Barnes, Burlington; Adolph Shane, Ames; and A. P. Twogood, Newton; Trustees.

Among the various items coming up for attention during the present year is one of vital importance, not only in Iowa but in every state where industrial work is being carried on. This is the matter of obtaining college entrance credit for regular industrial subjects, provided they are taught under competent teachers, for required lengths of time, and according to correct subject content.

Another matter to receive attention is a backbone, or nucleus around which the work of the state as a whole may be organized in order that the whole body may work, not on any single, iron-clad course, covering all work offered, but rather on a logical variety of locally adjusted courses with one definite aim in view. To this end, committees have been appointed to work on this problem and to make reports to the various sectional meetings in the spring, hear their various reactions and further digest the situation and report at the state meeting next fall. 1924-1925 looks like a big year—**L. G. Bennett.**

VOCATIONAL EDUCATION AT THE CINCINNATI MEETING

The program for the Department of Vocational Education and Practical Arts of the National Education Association, which meets in connection with the Department of Superintendence in Cincinnati, February 21st-28th, includes a number of important discussions of junior high school problems.

On Tuesday afternoon, February 24th, in the auditorium of the Guilford School, the Department will hold its first session around the general topic, "Measurements as Applied to Practical Arts and Vocational Education." The opening address will be given by Dr. H. A. Toops, Ohio State University, Columbus, Ohio. Mr. Charles Patrick, Bayonne, New Jersey, will speak on "Standard Tests as Applied to Practical Arts." Dr. Boyde H. Bode, Ohio State University, Columbus, Ohio, will speak on "Fundamental Principles Underlying Shop Try-Out Courses in Junior High Schools." Mr. Carl T. Cotter, director, industrial education, Toledo, Ohio, will give "An

Analysis of a Study of Graduates of an Industrial Arts Course in the Toledo High Schools."

The Department will have a dinner symposium, Tuesday, February 24th, at six o'clock. "The National Council of Education—Its Purpose and Scope of Work" will be the subject under discussion.

On Wednesday afternoon, February 25th, the Department will hold another session in the same school. Mr. C. E. Myers, State College, Pennsylvania, will speak on "The Relation of Measurements to Vocational Agriculture." "Measurements as Applied to Home Economics" will be discussed by Miss Clara Brown, University of Minnesota, Minneapolis, Minnesota. A general business meeting of the Department will follow.

The officers of the Department of Vocational Education and Practical Arts are: President, John N. Greer, assistant superintendent of schools, Minneapolis, Minn.; Vice-President, Benjamin W. Johnson, University of California, Berkeley, Calif.; Secretary, J. D. Blackwell, state director, vocational education, Baltimore, Md.

NEW YORK SCHOOL CRAFTS CLUB

Lloyd F. Stair, Madison, N. J.

The Industrial Arts are a big factor in the curriculum of the continuation school. This was brought out during a talk on the subject by Dr. Franklin Keller, Principal of the East Side Continuation School, New York City. Dr. Keller spoke to the School Crafts Club at the Ethical Culture School, 33 Central Park West, New York City, on January 17, 1925. Following Dr. Keller's talk three round tables were formed. Mr. A. W. Garritt, Supervisor of Shop-work, New York City, spoke on "Two Vital Problems of Industrial Supervision." Mr. Arthur Fattman of Public School No. 90, Brooklyn, spoke on "Color and Form as Applied to Shopwork." Mr. John Dockstader led the Forum, where a chance for extemporaneous discussion of problems is given.

The following men were received into membership by vote:

Mr. Max Wallenstein, New York City.
Mr. Haverhill Keegan, New York City.

Dr. Keller is in a position to give one a close view of the workings of the Continuation school. Several years ago he organized the school of which he is the principal. He has spent a great deal of time informing people through talks of the aims and work of such a school. People as a whole, either knew nothing about or opposed continuation schools. Gradually, however, the public is being won over, so that they are willing to help. The Smith-Hughes law provides for the support of continuation schools, in that they come under the division of part-time education. One-third of the money spent on vocational education must go toward part-time education.

One reason for the growth of these schools is that many employers are willing for their employees to learn to read, write and figure better. The railroad apprentice school is one line of development. Trade apprentice boys are more able to advance to responsible positions when better educated.

A big problem before the administrators of continuation schools is to instill faith among teachers that real teaching can be done in four hours a week.

Fundamentally the continuation school is a vocational proposition, enabling the pupils an opportunity to find their powers. When pupils have found themselves they must be placed where they can exercise their abilities. Training may be either of an extension nature parallel to the job or trade preparatory. Individuals must be dealt with and studied as cases. When this is appreciated by teachers the opportunity is tremendous. New York City has 40,000 pupils in continuation schools.

At the East Side School there are between thirty and forty different try-out courses possible. The aim is to find out what the child needs and then to put it across. The teachers are trained on the job, for in five years only one teacher has come with continuation school experience. Individuals must be studied regardless of morals or intelligence. The discipline must be of a severe nature, but securing the pupils' interest helps to keep disciplinary cases at a minimum.

The curriculum varies with individual needs. Most of the usual vocational subjects are represented. Classes have been formed for butcher boys and for jewelry workers. There are special classes for those attending night high schools. Job instruction sheets are used extensively in all subjects. Here ability to read with understanding is essential.

Industrial subjects should be the core of the curriculum in continuation schools, while related subjects should be considered as supplementary and incidental to individual work. Gradually continuation schools are getting vocational men to teach both the practical and related work. This may be modified among girls, where the home-making course must be taught by women academically trained.

Dr. Keller gave some interesting facts regarding the Milwaukee Continuation School which he recently visited. This is the only building in our country built for this purpose, covering a city block and having 180 rooms, six stories, modern construction. It has the ordinary features of a vocational school with a bakery, shops, foundry, etc. Foundry men pay boys to go to school and drop them if proved unsatisfactory there. This is considered a good investment by the foundry, since try-outs are avoided there. Home mechanics precede the other shops. The school has a teacher training program to develop teachers who know their job, have faith in their profession, and have knowledge of boys.

The justification of a program for part-time education depends for the most part on the proper selection of men and women teachers who believe in the work, see its possibilities, and train themselves in the technique of what pupils need to be successful.

A discussion arose following Dr. Keller's talk. A point brought out was that in many places there is still a lack of cooperation between pupils, employers, parents and courts with continuation schools. Many of the most reputable employers have no employees under 16 in order to avoid having their help leave to go to continuation schools. This leaves only a poor class of employers to contend with.

Mr. A. W. Garritt led a discussion on the relationship in city work between industrial arts supervisors and other administrative officers, such as the superintendent and his assistants in regard to the content of industrial arts courses. Mr. Garritt feels that the superintendent of schools should have a good deal to say in regard to objectives in our work. He should also decide such questions as to whether the industrial arts should be taught in grades other than the Junior High School period, and the general type of work that the industrial arts should cover. There should be cooperation between industrial arts and other subjects, and it is often very hard to get directors and supervisors of these various subjects to work in harmony. A greater felt central authority is necessary.

An instance was cited where various questions are brought up for discussion at meetings of shop teachers in which the supervisor acted as chairman. However, all resolutions are turned over to the Superintendent for his approval before they are executed. The Superintendent understands pupils and should have more opportunity to help in adapting the work to the needs of pupils.

In the Forum led by Mr. John Dockstader the subject of the continuation school hatched out again. Ways and means of getting industrial courses into continuation schools which have either none or very limited work was a question raised. In regard to the matter of financing, the proportion in Milwaukee was opened in 1912. This shows what slow progress is made in our most successful endeavors at the beginning. One continuation school has a skeleton house set up in order to give students in the home mechanics course practical problems in plumbing and other repairs.

Tests came up for discussion. This shows how the testing idea is getting a hold of shop teachers.

Mr. Arthur Fattman took up a practical phase of industrial arts in the use of enamel and polychrome finish. This is one means of giving our projects more of the appearance of commercial products. Mr. Fattman described a method to get the polychrome finish. First a coat of thick white paste is put on rough. Then after this dries hard a mixture of cold glue mixed with whiting to the consistency of pancake dough is painted on with a brush. This must be allowed to dry. Then flowers such as may be found in refuse cans from department stores are glued on and gilded. A coating of brown japan drier and color pigment is next painted on and some spots rubbed to show the gilt from below. The enamel finish is also fine for elementary work because defects may be puttied up and hidden under the flat paint and enamel.

Mr. Erik A. Andersen has been appointed director of manual arts, **Miss Alma C. Field**, supervisor of drawing, and **Miss Helen M. Cooper**, supervisor of physical training at Providence, R. I. The qualifications of the new directors were approved by the special committees following the adoption of a resolution approving the creation of the directorships.

NOW, ARE THERE ANY QUESTIONS?

Replies to questions will be made only when the name and address of the correspondent are stated. Most questions are not of general interest and replies are made by letter.

Gluing Joints

Q. 496. I would like to know if it is possible to tighten the clamps too tight when gluing anything in cabinet work, thus forcing too much of the glue out and causing a weak joint?—G. F.

A. The matter of glue joints is one requiring constant study and attention.

First, it is most desirable to know whether or not the wood is in proper condition to receive the glue. The joint should be properly made so as to show a tight closure throughout its entire length when held under light pressure in the clamps with no glue in the joint. This we term "setting up in the dry," and should always be done just before gluing to determine whether or not a joint is acceptable.

Second, the wood should be well cured and kiln dried with from five to seven per cent moisture, and should preferably be warmed for half an hour or more in a suitable hot box. In our shops we use a box three feet square by fourteen feet long, inside measure, with a small coil on the back face. Work to be glued is laid on the cawls so that the heat may penetrate all sides of board. These cawls are made from boards faced and edged on the jointer, surfaced to thickness and ripped to inch and a half squares. In getting out forty drafting tables, 24″ x 36″, the top is rough sawed and jointed 26″ x 38″ and the pieces piled in the hot box with at least two cawls between the tops, allowed to remain over night to be glued up first thing in the morning. A glue ladder is used to hold the clamps. This consists of a frame made of 2″ x 4″ x 8″ long with three cross strips, 1″ x 4″ x 30″; the top rail is notched at 6″ intervals so as to hold an iron T-bar clamp upright while the work is resting thereon. This enables clamps to be placed 12″, 18″, 24″, etc., inches on centers and takes care of odd size work very nicely. In gluing up a 36″ top, the fact that it is cut 38″ long in the rough is sufficient to allow three clamps on the under side and two alternate clamps on the top side, evenly spaced so as to equalize the pressure. This also permits clamping of heavy cawls to the face side of the boards at either end to insure them remaining perfectly flat during the process of hardening the glue, which in general should not be disturbed for five hours or more. Where ideal glue room conditions exist and a temperature of 90° to 100° F. can be maintained such work may be glued and dried an hour and a half to two hours and then surfaced, edged, and squared in a machine.

The glue itself should be Peter Cooper's Cabinet Maker's glue, or equal, and should be prepared by covering with cold water for at least twelve hours. For shop use the inside pot of an electric glue heater is filled two-thirds full of crushed flake glue, filled to the rim with cold water and allowed to soak at room temperature. When ready to cook each piece should hold its individual shape, but be soft enough to permit crushing between the thumb and finger when considerable pressure is exerted. A glue suitable for cabinet work should be sweet smelling as evidenced by the freedom from bubbles in the flake and the absence of odor when the thumb and finger are used to rub a flake quick enough to warm slightly; should be free from grease as evidenced by minute globules floating on top of hot glue; and in general should not give evidence of much foaming when beaten with an egg beater. This last is of considerable importance where veneer work is done. The soaked up glue should have any excess water poured off and the pot should then be put in a steam jacket or electric glue heater under full heat in order to quickly cook the glue to the point that the material is thoroughly in solution.

For soft wood, such as basswood, poplar, the stock glue should be thinned with hot water to the extent that a quarter of an inch bridge will show between the thumb and finger when the latter are dipped into the hot glue, withdrawn and slowly stretched apart. For hard wood, such as maple and birch, the glue bridge should be slightly less, breaking at ⅛″ to 3/16″ spacing. Under no circumstances should the edges of the board be sponged with warm water as I have known to happen. This will thin the glue at the joint, cause considerable shrinking during drying and give a weak joint. The board should be warm, dry, sized with sufficient glue to permit squeezing the excess from the joint, and should be clamped with a firm, even pressure such as could be produced without excessive effort.

Considerable study of the problem of gluing joints has caused me to conclude that failure in glue joints is in many cases attributable to undue pressure; especially is this true of hard wood. Tightening of the clamps should cease when all parts of the glue joints are in complete contact. Further pressure tends to remove the traces of the glue which go to make up a perfect glue joint. I do find it advisable to use a fiber scrubbing brush and hot water to remove all glue which squeezes out from the joints. This method is much easier than the use of the glue-hook after the glue is hardened as is the practice in some shops. This will in no way affect the moisture content of the wood provided the work is done quickly, but thoroughly, with hot water. The method also tends to even up the surface conditions adjacent to the glue joints and tends to prevent the sinking of the wood during the hardening of the glue.

It is generally advisable to cure glued-up tops from one to two weeks before surfacing in order that the contraction, which takes place surrounding the glue joints, may have ceased. Tops on which glue has been left to harden will tend to make machine knives dull very quickly when the tops are run through, even though a glue hook has been used. Such tops should never be run through a drum sander, else the paper will be gummed up beyond all hopes of doing good work.—Ralph G. Waring.

NEW BOOKS

Architectural Details

By Louis Rouillion and C. G. Ramsey. Cloth, wide imperial octavo. 131 pages. Price, $3. John Wiley & Sons, New York.

This book provides a series of plates for students of architectural drawing, in which all of the ordinary details of buildings are included. The arrangement is such that the student learns simultaneously the technique of architectural drawing, the ordinary conventions, the most widely used types of construction as applied to small buildings, and the development of architectural ideas from the preliminary sketches to the finished working drawings. The book is rather comprehensive and allows of a wide latitude in the selection and sequence of class work. The authors have carefully kept the subject-matter within the limits of the title and have avoided the discussion of planning and designing buildings. The work is well within the abilities of high school and trade school classes, and should be ideal for night classes of carpenters, etc.

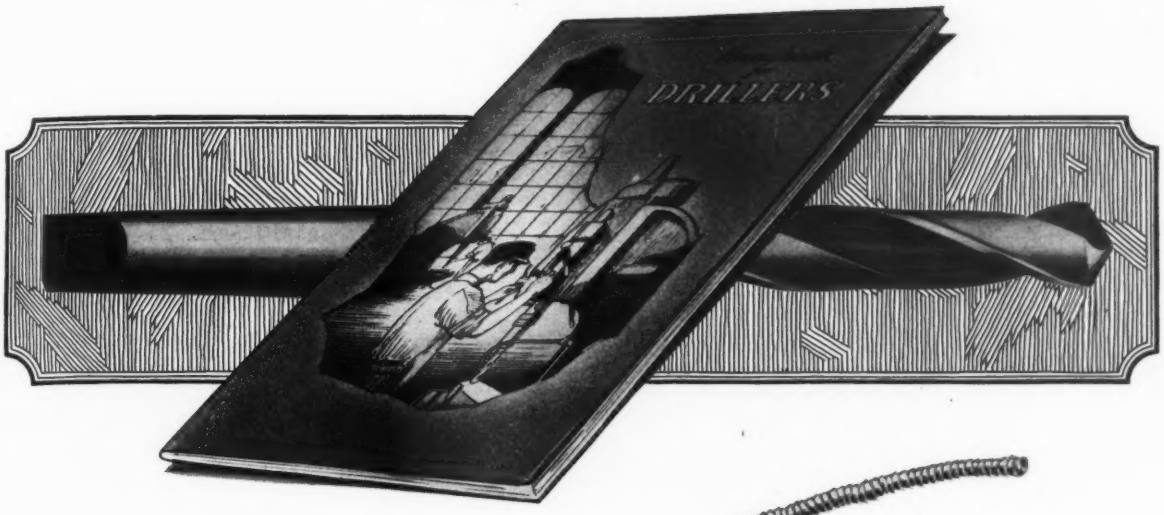
Teaching Shop Work

By Merritt Way Haynes. Cloth, 238 pages. List Price, $1.40. Ginn & Co., Boston, Mass.

This book is the outcome of the author's work in conducting training classes of shop teachers. It outlines very briefly the fundamental aims and organization of vocational education, and presents tried methods of trade analysis, teaching processes, school shop organization and management, and student analysis. It is, in fact, a very compact manual of pedagogy applied to shop classes.

The viewpoint is that of popularly accepted principles and methods, and its chief drawback lies in the fact that it seeks to compress within each chapter what might well fill an entire book. Thus, the chapter on psychology and student analysis touches only surface indications of the deeper and broader subjects of psychology and behavior. Many matters in this chapter, which are categorically stated, may be questioned and, in fact, can be contradicted.

The chapters on the preparation of the lesson and class organization are particularly helpful and clear.



More Holes Per Drill

Every student of machine shop practice should have a copy of this interesting and instructive booklet on drilling.

It offers a comprehensive introduction to the theory underlying the use of the twist drill. Instructors will find this booklet full of practical information and a valuable aid to the student in acquiring a knowledge of twist drills and their proper use.

Written in a non-technical style, this booklet is now being used as a text in Industrial, Vocational and Trade schools and by manufacturing establishments maintaining apprentice schools.

An outline of the contents follows:

THE POINT
- Axis
- Dead Center
- Heel
- Lips, Cutting
- Lips, Angle of
- Lips, Length of
- Lips Clearance, Angle
- Rake Angle
- Relief

BODY
- Body Clearance
- Flutes
- Starting a Drill

BODY (Continued)
- Margin
- Web

SHANK
- Tang

SPEEDS AND FEEDS
- Feed Pressure
- Starting Speeds and Feeds
- Too Much, Evidence of
- Too Much Speed, Evidence of

OPERATIVE HINTS
- Automatic Machines, Drilling with
- Brass Drilling
- Breakage, Drill
- Breakage, Tang
- Cutting Compounds
- Drifts and Drifting
- Drilling Hard Materials
- Drilling Small Holes
- Filing, is it a test
- High Speed Drills, Hints on use of
- Point, Thinning of
- Rough Holes, Cause of

A copy will be sent to supervisors and instructors of Industrial and Vocational Education on request.

For Use as a Textbook.

Copies of this booklet will be sent instructors, free of charge, in any reasonable quantities for use as a text by the students in machine shop practice.

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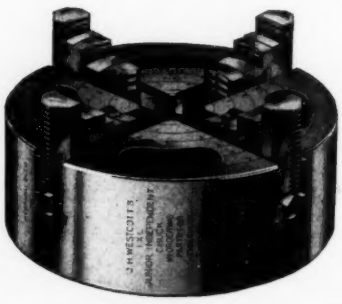
WESTCOTT'S
IXL JUNIOR INDEPENDENT
Lathe Chuck



Give the Boys an Opportunity to Learn the Use of Good Tools

A Philosopher once said:

"If you know a thing to be true and want others to know that it is true, tell them about it. Few men delve to get at the truth, but most men recognize it quickly if it is frequently and forcefully told."

So we are going to tell you frequently, and we hope forcefully, that WESTCOTT chucks are good chucks, and that on their past record, we believe they deserve your consideration.

To you, therefore, as a person interested in the education of American youths from the standpoint of vocational training, we suggest the adoption of WESTCOTT CHUCKS in your school machine shops—at least give us an opportunity to tell you our complete story.

MAY WE SEND A CATALOGUE?

WESTCOTT CHUCK COMPANY, Oneida, N. Y.

Manufacturers of Lathe and Drill Chucks since 1873

NEWS AND NOTES

Manual Training Report. Mr. C. A. Kunou, supervisor of manual training at Los Angeles, Calif., in his statistical report for January 15, 1925, gives detailed information on the number of pupils in attendance in classes, the number of teachers employed, and the number and character of the courses offered in this department of the schools. Mr. Kunou shows that there are 165 schools with manual training rooms, with a total of 24,178 pupils enrolled in the several classes. The average number of pupils per room is 146, while the average number per teacher is 202. The average number of classes per teacher is fifteen and the average number per room is eleven. There are a total of 3,237 manual training benches, with nineteen benches to the room. Of the total enrollment, 308 pupils are engaged in leather work, 191 in gilding work, 25 in metal work, nineteen in plaster work, and 102 in basketry.

Vocational Guidance Meeting. The Annual Conference of the National Vocational Guidance Association will be held February 19, 20, and 21, at Cincinnati, O., in connection with the meeting of the Department of Superintendence. The headquarters will be at the Hotel Gibson. There will be a number of sectional meetings on high schools, junior high schools, occupations and placement work, industrial personnel and psychological work. Among the speakers of prominence at the sessions will be R. D. Allen, Providence, R. I.; Edith Campbell, Cincinnati, O.; Arthur Payne, Columbia University, New York City; Cleo Murtland, University of Michigan, Ann Arbor; A. H. Edgerton, University of Wisconsin, Madison; Herman Schneider, University of Cincinnati, Cincinnati, O.; Jesse B. Davis, Boston University, and John M. Brewer, Harvard University, Cambridge, Mass.

Manual Arts Club Meets. The Manual Arts Club of the high school at Three Rivers, Mich., held its annual banquet at the high school early in January. The club claims a membership of 65 and is the only known club of its kind in any Michigan high school.

At the banquet, toasts were given by former President Robert Shoewalser, President Newman Drew, M. Harold Held, President of the Manual Arts Club at Western State Normal, M. Leo Handley, woodshop instructor in the high school, Mr. Harley Miller of the board of education, and Mr. Huff, drawing instructor at the Western Normal School. Mr. Emery Smith, director of the manual arts department, acted as toastmaster.

Second Unit of Rooms Completed. The second unit of 21 rooms for the junior high school at Wausau, Wis., has been completed and occupied with the opening of the new semester. The boys of the vocational school made all the teachers' desks, laboratory tables, tablet arm chairs, drawing tables and benches for this building, in addition to 25 drawing desks and six large tables for the agricultural school.

In addition to this work, the boys of the sheet metal department make all the waste paper and garbage cans of the city and all waste paper baskets, pails, cups and measures for the schools. In the machine shop are made such articles as lathes, arbor presses, jig saws, sanders, gasoline engines, steam engines, drill presses, grinders and many of the tools used in the shop. Machine shops of the city and nearby towns frequently send in machine-shop jobs where they find prompt and efficient service.

It is estimated that more than $5,000 was turned back into the city treasury last year for articles made and sold, and at least $2,500 were saved to the city in the furniture made during the year.

Try-Out Courses Offered. The junior high school at Wausau, Wis., offers try-out courses in millinery, dressmaking, sewing, cooking, nursing, painting, wood finishing, carpentry, cabinet-making, plumbing, sheet metal work, auto-mechanics and machine-shop practice to boys and girls of the school.

Prize Competition for Cover Design. The American Home Economics Association, Washington, D. C., has offered a prize of $50 for the best design for an emblem of the association, to be used on the cover of the Association's Journal, and on the stationery, programs, badges, and pins of the association and its affiliated organizations. The designs are to be judged on the basis of suitability, beauty, and technique. All drawings must be received between February 1st and April 1st, and should be addressed to Harriet Goldstein, University of Minnesota, University Farm, St. Paul, Minn.

Linoleum Printed Calendars. The manual arts department of Leominster, Mass., recently turned out creditable work in the form of linoleum-printed calendars for the new year. The pages were of light yellow, with illustrations in a variety of colors. They were designed, set up, printed and tinted by the boys and girls of the Leominster schools.

Boys Fitted for Trades. The Pana, Ill., high school, under the direction of Principal L. W. Chatham, has this year offered opportunities for the training of boys in the trades. The school is offering for the first time two comprehensive, four-year courses in automobile mechanics and building construction. The work is in charge of Mr. E. J. Harrison, who is a graduate of Rose Polytechnic Institute and has had experience in practical carpenter work. The work has the support of the Pana trades unions who have pledged their cooperation in conducting the courses.

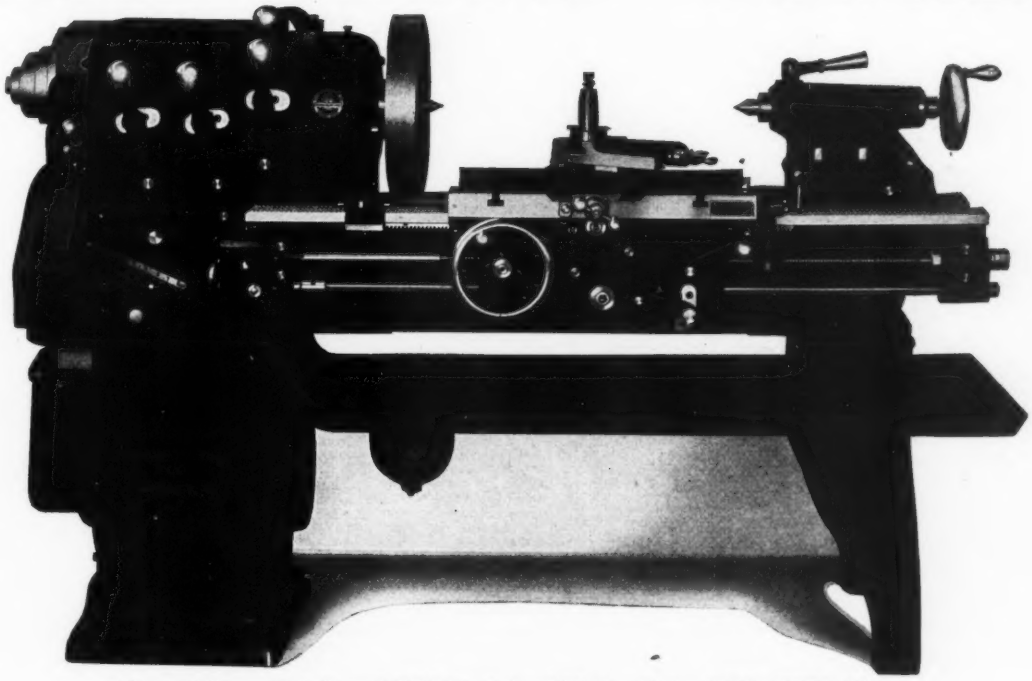
Plumbers' and Steamfitters' Class. A plumbers' and steamfitters' class has been formed at the evening vocational school, Schenectady, N. Y. Sessions are held two evenings each week.

Wall Paper Course. A course in wall paper hanging has been introduced at the Wilmington evening vocational school, Wilmington, Del. Materials and supplies are furnished free to the school by dealers and a number of local firms contribute wall paper and other supplies for instructional purposes. Mr. G. Z. Baldwin is the instructor of the class.

Trade Training in Los Angeles. Trade training is in large demand at the Grand Avenue Trade School at Los Angeles, Calif., and steps are being taken to establish a large vocational school cooperating closely with business and industries. The trade school at present offers courses in painting, interior decorating, linotyping, telegraphy, plastering, bricklaying, blue print reading and estimating for men engaged in these trades. Women are taught trade dressmaking and designing, trade millinery, design

(Continued on Page 24a)

Silent - Smooth - Powerful



14" x 6' Monarch 8 Speed Self-Contained Motor Drive Lathe With Chrome Nickel Steel Helical Gears and Ball Bearings in Headstock. Motor and All Wiring Inside Cabinet Leg.

These MONARCH lathes are the very last word in design and efficiency and adaptability for Vocational School use. The helical gears in the headstock are absolutely noiseless. Four large ball radial and six ball thrust bearings in the headstock eliminate friction and prevent wear.

The motor is mounted inside the cabinet leg where it is protected from oil and dirt, and all electrical wiring and connections can be housed inside the cabinet leg. Drive is through endless belt with adjustable ball bearing idler pulley.

The only noise made by the helical geared MONARCH lathe is the swishing of the oil in the headstock. Operation of the entire lathe is fool proof. If desired a heavy glass cover plate can be put on top of headstock making the inside visible.

MONARCH lathes are standard equipment in many of the best production shops and tool rooms. Our large production enables us to offer these lathes as the very finest lathes ever offered for Vocational School use and at prices within the appropriation limit of those schools desiring good machine shop equipment.

We will gladly send you catalogue and special bulletin describing these new lathes.

America's Largest Builder of High Grade Lathes

The Monarch Machine Tool Company

404 OAK STREET SIDNEY, OHIO.

Why do the Toolmakers Work with Starrett Tools?

Back of your Starrett Tools is the satisfaction of two generations of crack machinists. Find the best mechanic in any shop and invariably you will find a Starrett Booster. His work calls for the closest fits, the closest limits, the closest measurements. The Precision Tools it takes to do the job, ***he's got.*** Naturally, his choice is Starrett. Accuracy, of course, but more than that. Design that means easy, rapid work. Workmanship that keeps a Starrett on the job years beyond the serviceable life of other tools. Confidence that comes through working with Tools he's always found reliable.

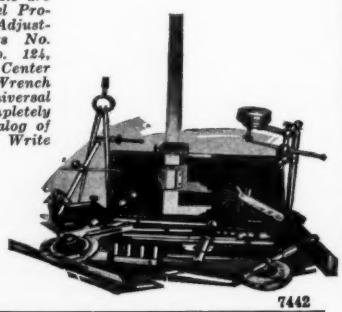
Toolmakers, Foremen, Inspectors — they're not using Starrett Tools for the fun of it. The pay envelope tells the story.

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled

ATHOL, MASS.

In this group of Starrett Tools are the Improved Universal Bevel Protractor No. 359 (with Fine Adjustment), Toolmaker's Dividers No. 277, Inside Micrometers No. 124, Automatic Adjustable-Stroke Center Punch No. 18, T-Handle Tap Wrench No. 93 and Toolmaker's Universal Surface Gage No. 56. All completely described in the Starrett Catalog of 2200 Fine Precision Tools. Write for No. 23 "CE."



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(Continued from Page 22a)

and flower making, trade hair dressing, manicuring, telegraphy and interior decorating.

Gives Fund for Trade School. Mr. Theodore Ahrens, a capitalist of Louisville, Ky., has presented the city with a gift of $150,000 to be used for the establishment of a trade school. Definite plans have not been completed, but it is expected that the new school will be devoted exclusively to the teaching of trades. It will be known as the Theodore Ahrens Trade School and will have classes for both boys and girls. It is expected that the school will be located in the old high school, now known as the vocational school, until a more appropriate site is obtained for the permanent location.

New Vocational School. The board of vocational education at Beloit, Wis., has asked for an appropriation of $110,000 from the city for the erection of the proposed vocational school. Plans prepared by the architects indicate that the cost of the building will reach $160,000.

Painting and Decorating Classes. Classes in painting and decorating have been introduced in the vocational schools of Philadelphia with the opening of the second semester. The classes are held in two large basement rooms in the McCall School and sessions are held three evenings each week. The classes are intended for boys and young men under 21 years of age, employed in the trades, and for those over 21 years who have been employed for some time.

New Vocational Body. A National Council of Vocational Education has been formed by leaders in four organizations of vocational education, following the annual convention of the National Society for Vocational Education. Mr. J. N. Greer, Minneapolis, is president, and Dr. Alice Blood, of Boston, is secretary-treasurer.

To Approve Machines in Vocational Schools. Donald Kidd, supervisor of industrial education at Syracuse, N. Y., has won his fight to secure the right of approval in the purchase of equipment for vocational schools of the city. He has been asked to pass on all bids for equipment previous to the letting of contracts. The change in policy is due to severe criticism of certain types of machinery purchased and delivered to the schools, which was found to be highly unsatisfactory and in some cases even dangerous, because of the lack of adequate guards.

Survey of Manual Arts. The board of school directors of Milwaukee, Wis., has adopted a resolution providing for a survey of the manual arts department, with a view of promoting its efficiency, inducing more students to take the courses, and strengthening the curriculum. The survey is to be conducted under the direction of the superintendent and the committee on course of instruction.

Apartment for Home Making. A three-story brick residence in Brooklyn, New York, has recently been taken over by the Brooklyn Continuation School as a home making annex. The building has been renovated and adapted to the uses of a school. Here the girls of the school will receive instruction in sewing, dressmaking, cooking, costume designing, and related work. The ground floor contains a model apartment where the girls learn the care of a home.

Metal Drafting Taught. Evening classes in hollow metal drafting and blue print reading for men employed in the hollow metal trade have been introduced at Jamestown, N. Y. About forty men are in attendance in both the beginning and advanced classes.

Evening Vocational Classes. The second semester of the evening school at Fort Wayne, Ind., opened with classes in automechanics, machine-shop practice, mechanical drawing, blue print reading, printing, millinery, and dressmaking.

Heat Treatment of Steel. A short course on heat treatment of iron and steel has been introduced in the evening vocational school at Kokomo, Ind. The course consists of six lectures and demonstrations covering the manufacture of iron and steel, methods of selection, tempering, case-hardening, and other phases of heat treatment. All classes of men, from the manager to the apprentice, are eligible to the course.

Promote Vocational Education. Senator Sheppard has introduced a bill in Congress providing for the promotion of prevocational education. The bill would require cooperation between the states and the Federal government in stimulating education in agriculture, the trades and industries.

Printing Course. The board of education of Springfield, Ill., recently voted to offer a full-time course in printing in the high school. The course opened with the second semester and is in charge of Mr. Carl Duke.

Trade Classes for Apprentices. Part-time trade extension classes for bricklayers' and carpenters' apprentices have been established at Rockford, Ill., in addition to the other full-time, part-time and evening trade extension work.

Class for Carpenter Apprentices. A class for carpenter apprentices has been established at Decatur, Ill. The work is supported by the carpenters' union and is in charge of Mr. H. H. Radcliffe.

New Building for Shop Purposes. The Thornton township high school at Harvey, Ill., will erect a new addition which is to be devoted to shop rooms. Provision has been made for automechanics, machine-shop practice, electro-mechanics, forging, printing and mechanical drawing. The building will be completed for the new term in September next.

Survey of Vocational Needs. A survey of industrial, home economics and commercial conditions in the city of Reading, Pa., was recently completed and a report submitted by L. H. Dennis, director of the state bureau at Harrisburg. The report throws some light on the needs of vocational training in the city and serves as a guide for future provision of school facilities in this direction.

Industrial Art and Music Center. Steps have been taken recently for the establishment of an industrial arts and music center in New York City. The Jerome Park Reservoir Tract has been selected as a suitable location for the center. The school will have an auditorium seating 2,500 persons, more than one hundred classrooms, a modern theater, cafeteria, gymnasium and library, in addition to a number of small rooms for each art. In the establishment of the school, particular attention will be given to the various art trades to be taught, as well as to the selection of the best all-around man to act as principal.

(Concluded on Page 26a)

Associating with Great Minds

THE-BOY-AT-THE-TYPE-CASE to-day is the man of knowledge to-morrow. Master minds are his teachers. The copy he is setting to-day may have been written by *Shakespeare* more than three hundred years ago; his lesson to-morrow may have been written by *Victor Hugo;* the next day will, perhaps, bring copy from a modern writer, or from the editor of the school paper. Each project he undertakes is different, and each brings its new thoughts and inspirations.

The-boy-at-the-type-case soon realizes the importance of correct spelling, paragraphing, punctuation, capitalization, and word arrangement. To him language rules are tools which he must use, and use properly, to build his finished product. The building of a beautiful piece of printing requires the application of thought, skill, and artistry, governed by the rules of grammar, English, and arithmetic. Surely such a combination makes Printing one of the master tools of education.

The expense of installing printing in your schools is no more than that of other manual arts subjects. There is a printing outfit for every type of school. Write, giving details regarding the kind of school you hope to equip with printing, and let us send you full information regarding all details of installation. If desired, a representative of the American Type Founders Company, from its nearest Selling House, will visit you for a personal interview. The school year is well under way—write to-day.

F. K. PHILLIPS, *Manager,* EDUCATION DEPARTMENT

American Type Founders Company

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A CORPS OF TRAINED EDUCATORS, ENGINEERS AND SALESMEN AT YOUR SERVICE

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THE interchangeability of the parts of Weber Riefler Instruments may seem but a matter of convenience. And in truth, it is a great convenience, in case of loss, to have your dealer replace the missing part. But that is not all. The interchangeability proves beyond doubt that Weber accept no two standards for accuracy in the manufacture of Round System Instruments. In other words each part must be a counterpart of all similar parts in order to be accurate. And because they are made accurate Weber-Riefler Instruments perform accurate work. The next time you pass your drawing supply house ask to see a set. Write for catalog of complete Weber line. Address Dept. I.A.

F. WEBER CO.,

1220 Buttonwood Street, Philadelphia

705 Pine St. St. Louis — **227 Park Ave. Baltimore**

WEBER

Drawing Instruments & Materials

The Original Round System

(Concluded from Page 24a)

Students Build Garage. The carpentry classes of the part-time schools at Salamanca, N. Y., recently completed a garage 13 feet by 21 feet in size. The entire work was done by boys 14 and 16 years of age.

Centralize Trade Classes. Centralized continuation schools for the building and printing trades of New York City have been proposed by the board of education, as part of its program for the development and extension of continuation schools for young workers.

Bonds for Vocational Schools. Bonds in the amount of $1,350,000 were recently sold by the finance committee of the board of freeholders in Essex County, New Jersey. Of the total, $1,100,000 were issued to meet the cost to the county of purchasing the Boys' Vocational School and the lease on the Girls' Vocational School in Newark. The remaining $250,000 were for the purpose of covering the expense of building a vocational school in Irvington.

Vocational Classes. The second semester of the evening schools opened at Erie, Pa., with classes in commercial arithmetic, art, machine shop practice, electricity, architectural drafting, mechanical drafting, sheet metal drafting, shop mechanics, plumbing, builders' mathematics, and steel square.

California and New York Win Bossom Prize. Students in industrial arts design in California and New York were the prize winners in the Alfred C. Bossom Art Competition, conducted by Corona Mundi, Inc., international art center of New York City. Prizes of $100, $50 and $25 were given for the best designs in furniture and interior decoration. The first and third-prize winners in interior decoration were also winners in the costume design contest held by Corona Mundi last year.

Instructional Courses in Wood. The U. S. Forest Products Laboratory, at Madison, Wis., has announced a series of instructional courses in wood utilization, to be given at the Madison laboratory this spring. The courses are as follows: Gluing of wood, April 20-25; kiln-drying lumber, April 27 to May 8; boxing and crating, May 4—9.

Tulsa Club Discusses Discipline. The Tulsa Manual Arts Club, of Tulsa, Okla., at its monthly meeting held on January 12th, discussed "Shop Discipline Problems and Their Solution." The discussions took up the details of equipment, interest, and individual problems as related to the subject of discipline in the shop.

Home Economics Cottage. On January 9th the city of Frontenac, Kans., dedicated a home economics cottage, which is believed to be the first of its kind in the state.

Vocational Sewing Class. A vocational sewing class was organized at Leavenworth, Kans., in October, with the cooperation of the state board of vocational education and the local board of education. The first two months were given over to the elementary work given to a class of 27 students. At that time the advanced work was taken up with a total enrollment of 59, representing women from nearly all walks of life.

Some of the work undertaken by the elementary class were different types of stitches, line and color, button-holes and placket making. The advanced students took up cutting and fitting, and each woman made at least one dress during the course. Other things undertaken were the making of children's garments and undergarments, and a brief study of textiles. It is planned to close the work of the term with a fashion show.

Home Making for Adult Women. Sixteen classes in home making for adult women were offered at Kansas City, Kans., during the last term. The classes took up millinery, dressmaking and foods.

Paper Hanging and Decoration. A short course in paper hanging, painting and decorating was offered recently at Des Moines, under the auspices of the Iowa State College Extension Division and the State Board of Vocational Education.

Rug Weaving. A large loom for the weaving of rugs and carpets was recently installed in the ungraded room of the Columbia School, of Evansville, Ind. The pupils in this room have done some excellent work in weaving raffia mats.

Shop Courses. Courses in blue print reading, mechanical drawing, machine-shop practice and wood working are being offered at the Harding High School, Marion, O. The courses are conducted two evenings each week for a period of ten weeks.

High School Trains Printers. The high school at Newport News, Va., is training a group of students in printing. The class prints all the forms and literature used by the school system and also has charge of the high school printing. The class has an enrollment of twenty pupils.

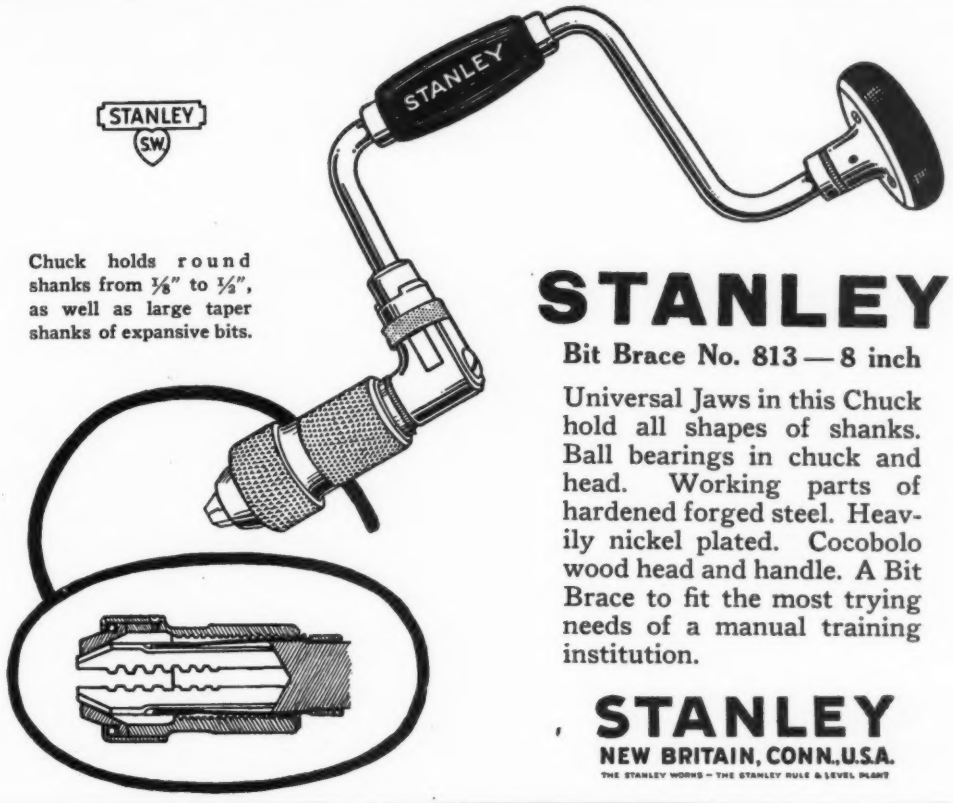
Shop Classes. The vocational shops at Anderson, Ind., have been moved from the basement of the high school building to the new gymnasium building. Classes in automobile mechanics, machine-shop practice, oxy-acetylene welding, pattern-making and woodwork are being given in the new quarters at the present time.

Builders Propose Pupil Training Test. A proposal to test in Minneapolis schools the Cincinnati plan of cooperative industrial training has been presented to the Builders' Exchange by the secretary of the organization. It is believed the proposed system would work out successfully in conjunction with the vocational high school and the new technical high school planned by Supt. Webster.

Pottery Exhibition. The pottery division of the industrial arts department at Wheeling, W. Va., held a display of their products at the Tercentenary Educational Exhibition, held in November last, in New York City. A similar exhibit, with added work in copper, brass and aluminum was held at the N. E. A. exhibition in Cincinnati.

Miss Grace Schermerhorn, formerly director of home-making in the city schools of New York City, died on January 11th, at a local hospital, following a brief illness. Miss Schermerhorn was well known in school circles from the time she arrived in New York until her resignation to accept the post of assistant director of the American Child Health Association about a year ago. While in New York, she rewrote the course of study in cooking, and also cooperated with the school lunch association in placing the lunch system on a business basis.

Course for Printers. A class in cost estimating and typography has been formed at the New York Evening High School. The class is open to men and women in the printing, advertising, publishing and allied industries.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Chuck holds round shanks from ⅛" to ½", as well as large taper shanks of expansive bits.
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Bit Brace No. 813 — 8 inch
Universal Jaws in this Chuck hold all shapes of shanks. Ball bearings in chuck and head. Working parts of hardened forged steel. Heavily nickel plated. Cocobolo wood head and handle. A Bit Brace to fit the most trying needs of a manual training institution.
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THE STANLEY WORKS — THE STANLEY RULE & LEVEL PLANT

SHEET METAL APPRENTICE CLASSES IN THE ST. LOUIS SCHOOLS

At the opening of the school year in September, 1924, a group of 45 sheet-metal workers' apprentices of advanced standing were formed into two classes at the Central Evening School and a group of twenty beginning apprentices formed into an evening class at the Jefferson Vocational School. This was a culmination of several years' work on the part of the Joint Apprenticeship Committee of the Union, and the Sheet Metal Contractor's Association, cooperating with the public school authorities of St. Louis.

The group of 45 apprentices of advanced standing attending the Central Evening School include among their number, some who attended the first apprenticeship classes, under the supervision of the public schools opened in March, 1923, and most of the 45 attended the apprenticeship classes at the Central High School during last school year, September, 1923, to June, 1924. These advanced students are divided into two classes, each giving one evening per week to drafting and one evening to mathematics. Since each of the classes contains some in their fourth year of their apprenticeship, and others in their second or third year, the work in drafting is conducted upon an individual basis. The course has been worked out through the experience gained by the teacher during the previous two years of instruction in sheet-metal drafting. By the individual method, the needs and interests of men in various lines of work such as sky-light pattern development, cornice work, duct and blow pipe work, are efficiently cared for. The group of beginning apprentices in attendance at the Jefferson Vocational School is taught drafting during their first year, to be followed, as with the present advanced classes, with advanced drafting and mathematics in succeeding years.

The instructor for the classes at the Central Evening School and also at the Jefferson Vocational School is Fred W. Hebberger. He has had many years of experience in various branches of the sheet-metal trade, and is now employed as an instructor in the day classes at the Jefferson Vocational School.

Previous to the formation of classes in March, 1923, there had been various efforts to obtain attendance upon the part of apprentices at some accredited school teaching pattern drafting. In the early part of 1923, the reorganized Joint Committee on Apprenticeship recognized the necessity of adopting a definite policy of trade education, and, with the cooperation of the public school authorities, classes in sheet-metal pattern drafting were opened in the Central High School in March, 1923, with an initial enrollment of thirty. This number increased to 45 before the close of the school term and re-opened in September, 1923, with an enrollment of fifty; 42 being under the supervision of the Joint Apprenticeship Committee, and the others from the socalled "open shops."

In the new apprenticeship contracts, effective this year, the apprentice agrees to attend classes two evenings per week and the employer agrees to send the apprentice to any classes arranged by the direction of the Joint Committee. The apprenticeship covers a period of four years, with semi-annual increases in pay partly contingent upon the school report concerning the attendance, progress and conduct. The applicant for apprenticeship must be over 16 years of age and under 21 and of good character. No definite scholastic requirement for new apprentices has been adopted and, as yet, no standards for measuring the progress of the student in school instruction or in trade work have been set up but a solution for these problems is being sought. The Committee is receiving the support of the employers, the Union, and the school authorities and, in this way, St. Louis is making a determined effort to be among those training sheet-metal apprentices according to a well-defined plan of school education, supplemental to the daily trade experience.

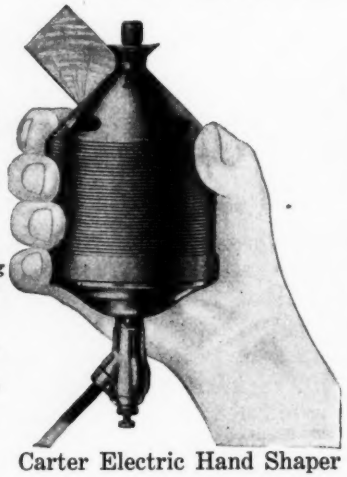
Christmas Greetings. The high school press at Medford, Mass., has published two interesting Christmas greetings as regular school projects. One of the greetings was prepared by boys of the class for their own use and for the use of students in the school. The other was designed, set, and printed for Mr. James Robinson, instructor of printing. The greetings were in all cases printed in two colors.

Two Little Machines of a Thousand Uses!

For the Up-to-date Wood-shop

You should not be without them—they're Carter Products

For Corner Rounding, Beveling, Concave Cuts, Corner Beading, Surface Beading, Chamfering Moulding-cutting, Veneer-trimming, Small-mortising, etc.



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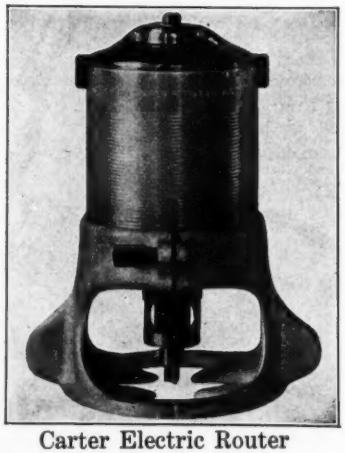
⅛-h.p. Universal Motors Operate from Lighting Circuit

Hand Shaper complete with 4 cutters, $36.00

Router complete with 3 bits $44.00



Carter Electric Router

For Line, Inlay, Two-tone Work, Fluting, Veining, Veneer-patching, Routing for Hinge Butts and Hardware, Etc.

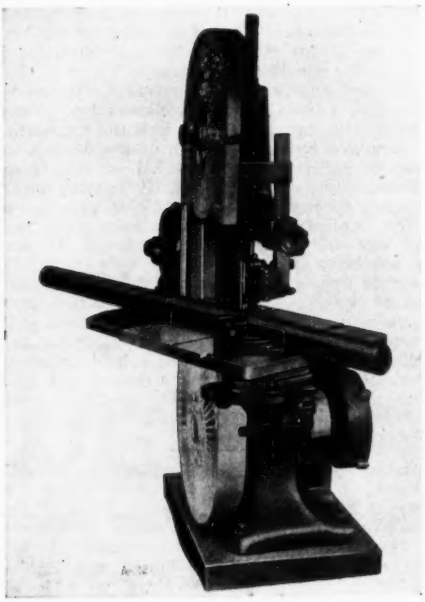
Numerous attachments for each machine

Write for our Circular.

The R. L. Carter Co., Inc., 1238 S. State St., Syracuse, N. Y.

TRADE PRODUCTS

"Racine" Duplex Band Saw. The Racine Tool and Machine Company, Racine, Wisconsin, are bringing to the attention of shop instructors an important new development and addition to their line. They offer a new model of the "Racine" Duplex band saw for cutting wood, soft metals, steel and iron. This machine has the feature of swiveling the table and saw guides in such a manner as to direct the blade to any desired angle, thus making possible the cutting of long lengths of stock. This is accomplished by mounting a roller guide on the table column immediately below the cutting point. The table and lower guide are integral and swivel together. An upper guide is mounted on the regular guide post, and is capable of swiveling about the blade as a center. Thus the blade is supported immediately above and below the work and a straight cutting edge is presented to the material regardless of the amount of twist given to the blade.



THE NEW RACINE DUPLEX BAND SAW.

These swivel guides deserve mention. Two small hardened rollers, accurately ground and containing ball bearings, support the blade on either side. A larger roller, also hardened and ground and ball bearing, supports, the blade on the rear and takes the feeding pressure. Adjustments for alignment of the guide horizontally are provided as well as adjustments for width and thickness of blades. Thumb screws and hand wheels are used throughout. No wrenches are required.

The new machine has a duplex or change speed, thus making possible the cutting of a variety of materials and shapes at the proper speed and with the correct blade. The machine has two distinct improvements over the straight band saw. (1) It can be used for cutting straight on ordinary work, and can also be used for cutting long lengths of stock, such as boards, pipe, bar stock, etc. (2) The blade can be guided or adjusted minutely to compensate for faulty brazing or inaccuracies in filing and setting. On ordinary machines such variations may cause the blade to crawl, and make it nearly impossible to use a fence or guide to cut multiple pieces in parallel strips. By directing the blade slightly to right or left, by means of the swivel guide, crawlings can be overcome and perfectly straight perfect cuts of any length will result.

Numerous attempts have been made to perfect a workable swivel guide, but heretofore no practical device has been put on the market. This latest achievement in design is a distinct addition to the band saw field, and makes this type of machine almost universal in character.

TRADE PUBLICATIONS

Handbook for Drillers. Twelfth Edition. Issued by the Cleveland Twist Drill Co., Cleveland, O. This volume is designed for students of drilling and presents a few of

(Concluded on Page 32a)

You Too Can Learn What He Found Out About The New "Prang" Tempera

Said Mr. Harper; "Tell your Art Department, I thank them most sincerely. Your new "Prang" Tempera surpasses oils a thousand ways in the decorating of toys."

The new "Prang" Tempera colors have all the intensity of the spectrum, and brilliancy of the rainbow itself.

Toy making will take on a fresh impetus when your pupils learn that the last step will be the best of all—the applying of the dazzling "Prang" Tempera finish!

The Art Department of The American Crayon Company has made a special study of your problems. Drop them a line about it today.

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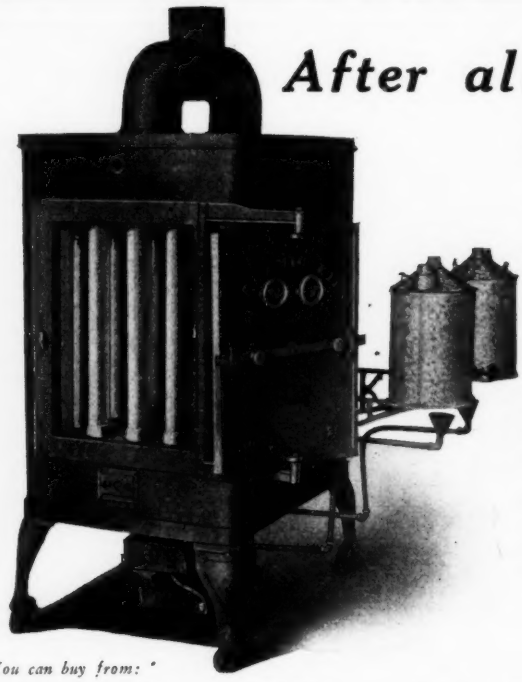
"Old Faithful"



After all the Lining is the Kiln!

—and you never used a lining that will please you quite so much as the super-refractory lining in the Denver Fire Clay Company Keramic China and Pottery Kilns.

These Kilns embody perfections of design attained through years of experience. They are made in nine standard sizes and equipped with gas, kerosene or fuel oil burners, as preferred by you.

Descriptive bulletins and price together with suggestions from our Engineering Department will be furnished upon request.

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DENVER COLORADO

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(Concluded from Page 30a)

the underlying theories governing the use of the twist drill.

Among the topics covered in the pamphlet are the parts of a twist drill, grinding, lip clearance, drill speeds and feeds, small hole drilling, cutting compounds for metals, thinning points, and common errors. There is a table of cutting speeds for drills and a few examples of the most popular and widely used drills and reamers.

How to Run a Lathe. Edition No. 25, revised and enlarged. Price, $0.75. Issued by the South Bend Lathe Works, South Bend, Ind. The pamphlet offers instructions on the care and operation of a screw-cutting engine lathe as an aid to the beginner or apprentice in the machine shop or the student in the regular school shop. Among the subjects covered in the pamphlet are locating and setting the lathe, hanging the countershaft, calculating speed and sizes of pulleys, lacing a leather belt, oiling, safety devices, grinding and sharpening the cutting edge, centering, countersinking, rough and finish turning, facing, machining, turning, mounting and the use of testing instruments for chuck and face plate. The pamphlet is most useful in any shop.

Everyday Art. The January issue of the interesting and valuable house organ of the American Crayon Company contains interesting articles on design, art week in a public school system, art and the boy scout movement, and art for home making. Copies will be sent to any reader of the **Industrial Arts Magazine** on request to the firm at Sandusky, Ohio.

Valuable Information on Pine. Teachers are constantly looking for information to be used in the "related subjects" work. Frequently the collecting of this material involves hours of labor and planning, and considerable study of reference books. As a means of aiding teachers of woodwork, carpentry, and architectural drawing, the California Pine Association has issued a series of eleven information sheets on California pine, its characteristics, its grading, and its uses. These information sheets each take up a specific topic and are fully illustrated with photographs, drawings, and tabulations so that they are immediately usable for teaching outlines. A list of the sheets is as follows:

1. California White Pine—its uses, its production, and grading.
2. California Sugar Pine—its distribution and characteristics, its uses and durability, its production and grading.
3. The Uses of White and Sugar Pine in making doors and door frames for interior and exterior uses in dwellings, garages, and in cabinet work.
4. Pine Sidings—their uses, grades and sizes. The ordinary standard bevel siding and eighteen types of novelty sidings are taken up.
5. California Fir and Incense Cedar—their production, characteristics, advantages, and grading.
6. Pine sash and frames, types and construction, and proper use.
7. California Pine interior trim and mouldings.
8. California Pine exterior finish and porches.
9. California Pine in factory and shop lumber.
10. California Pine dimension and boards.
11. California Pine Lath—its uses and grading.

The California White and Sugar Pine Association has also issued a valuable pamphlet entitled "Pine Homes," summarizing effective types of construction and finish for small and large houses, and for garages, garden conveniences, and accessories. The pamphlet is fully illustrated, and is particularly valuable for shop teachers.

Copies of all of the foregoing publications will be sent to any reader of the MAGAZINE who addresses the association at 600 Call Building, San Francisco, Calif.

Sheet Metal Tools and Equipment. The Niagara Machine & Tool Works, of Buffalo, N. Y., has just issued its new circular No. 103, describing and illustrating tools and equipment for use in sheet metal classes. The circular offers a typical shop layout and lists such equipment as bench machines, floor machines, hand tools, individual bench equipment and soldering equipment. Plans Nos. 4 and 5 show typical shop layouts for general shops in which sheet metal work is combined with other subjects. The equipment is suitable for small classes working as a unit, or for a combined class of ten to fifteen students.

The firm also issues special catalogs illustrating complete lines of bench machines and floor machines for sheet metal shops.

Fortunate is the Student—

who enjoys the refining influence of art—who has the opportunity of becoming familiar with the highest standards of beauty in form and color.

The colors the children work with should, therefore, be such that they will develop a real conception of, and love for, the beautiful in every heart.

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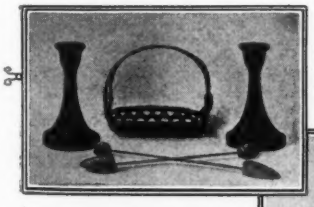
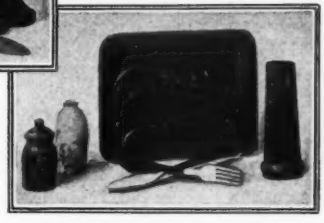


Many knickknacks can be beautified with Enamelit



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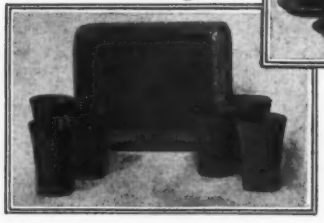

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PUBLICATIONS RECEIVED.

Architectural Details

Louis Rouillion and C. G. Ramsey. Cloth, wide imperial octavo. 131 pages. Price, $3. John Wiley & Sons, New York.

This book provides a series of plates for students of architectural drawing, in which all of the ordinary details of buildings are included. The arrangement is such that the student learns simultaneously the technique of architectural drawing, the ordinary conventions, the most widely used types of construction as applied to small buildings, and the development of architectural ideas from the preliminary sketches to the finished working drawings. The book is rather comprehensive and allows of a wide latitude in the selection and sequence of class work. The authors have carefully kept the subject matter within the limits of the title and have avoided the discussion of planning and designing buildings. The work is well within the abilities of high school and trade school classes, and should be ideal for night classes of carpenters, etc.

Textile Assignments

Prepared by the teachers in the Manhattan Trade School for Girls. Paper, 26 pages. Price, $0.75. A. S. Barnes & Co., New York, N. Y.

The Dalton Plan of Education has again been adapted to the subject of textiles as carried out in the Manhattan Trade School for Girls, in New York City.

The assignments are made on the basis of three and three-quarters hours per week, devoted to textiles. They are divided into two parts: Assignments proper, and exercise sheets. Among the subjects covered are structure of cloth, weaves, variations in color and weave, dyes, bleaching, sizing, finishing of cloth, calendaring, mercerization, woolens and worsteds, tests of materials, care of materials, staining and selection of materials.

The work is kept in a loose-leaf book and credit is given after the pupil's knowledge has been tested in oral recitation.

The material is suggestive for schools which are struggling with the problem of correlation between vocational and general subjects and is of such an interesting character that it readily holds the interest and enlarges the capacities of pupils.

PERSONAL NEWS

Mr. C. A. Bryant has been appointed as vocational instructor in the schools of Carnesville, Ga.

Mr. Thomas F. O'Mahoney has assumed the office of business manager for the vocational board of Essex County, N. J. The change is in the direction of more adequate control and administration of the business affairs connected with the handling of the vocational work by the county. Mr. O'Mahoney will have entire supervision of the details of building, supplies, payrolls, and contracts, as well as the work of educational supervision.